NEW

VOYAGER

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AN MAP PUBLICATION

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ISSUE No. 2 WINTER (DECEMBER) 1982

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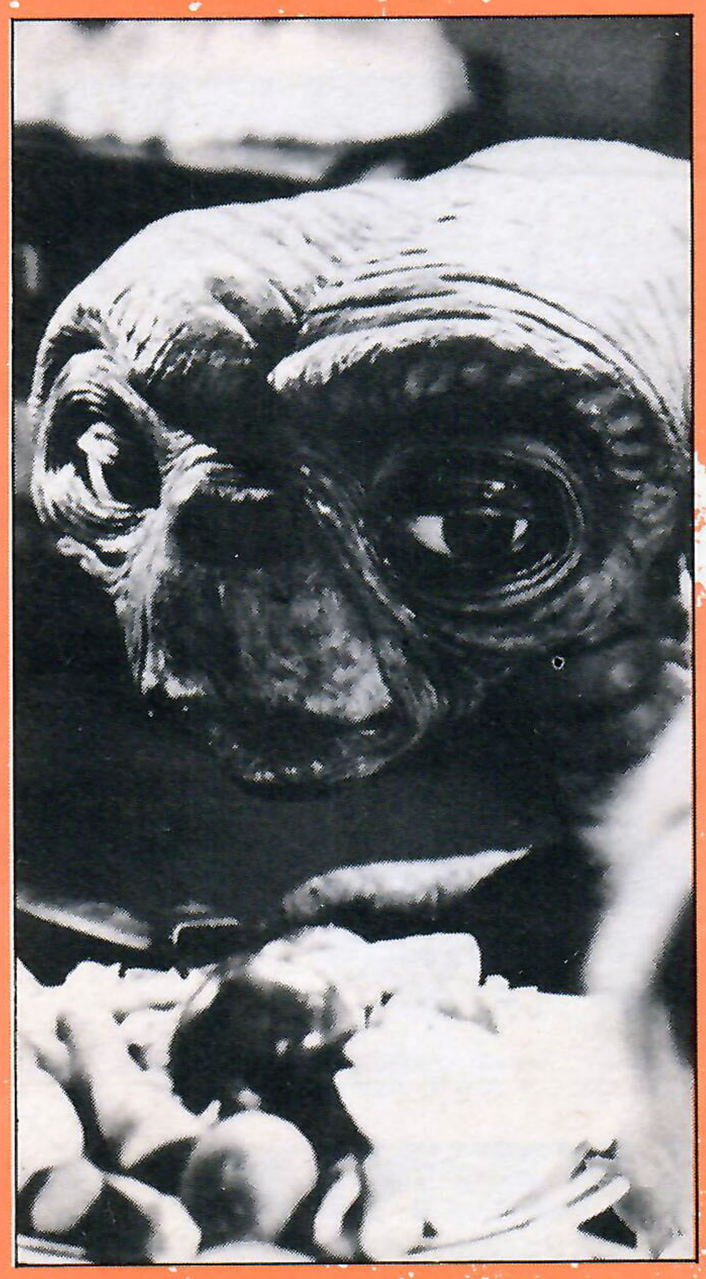

ON THE COVER
He's here at last! *E.T.* arrived *officially* in the United Kingdom during December in the wake of heavy media coverage. Spielberg's latest blockbuster is one of the leading features in our second issue. Photos: Copyright © 1982. United International Pictures (UK).

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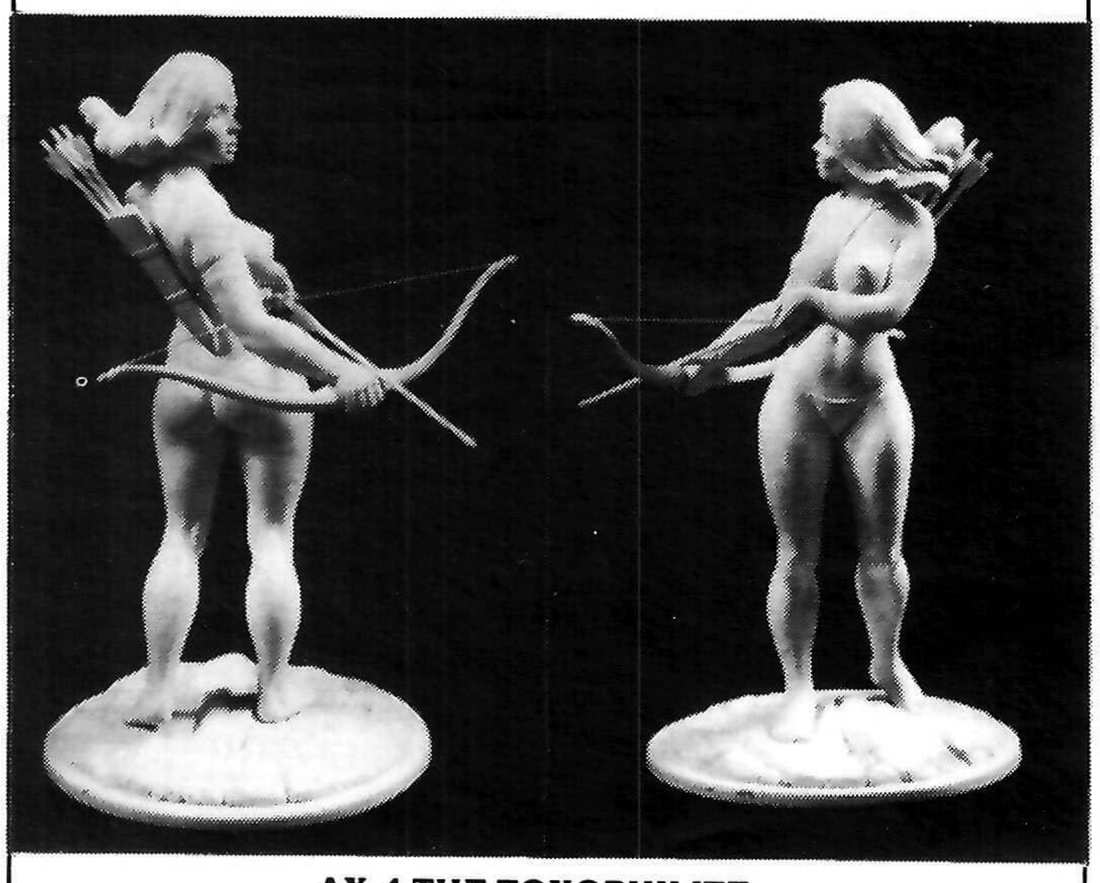

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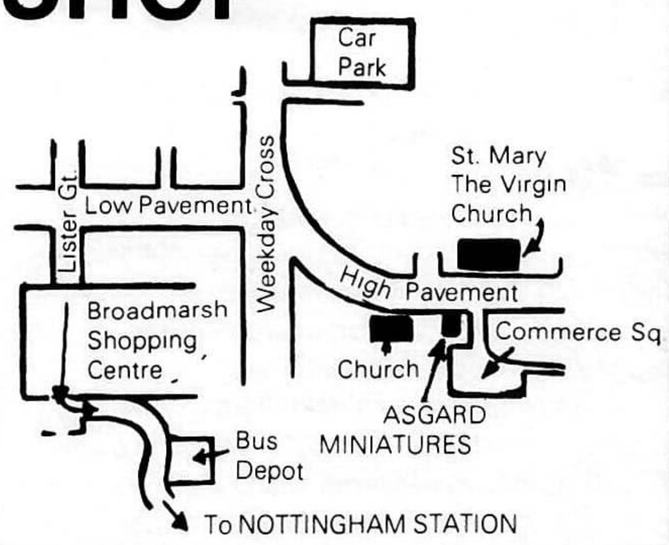

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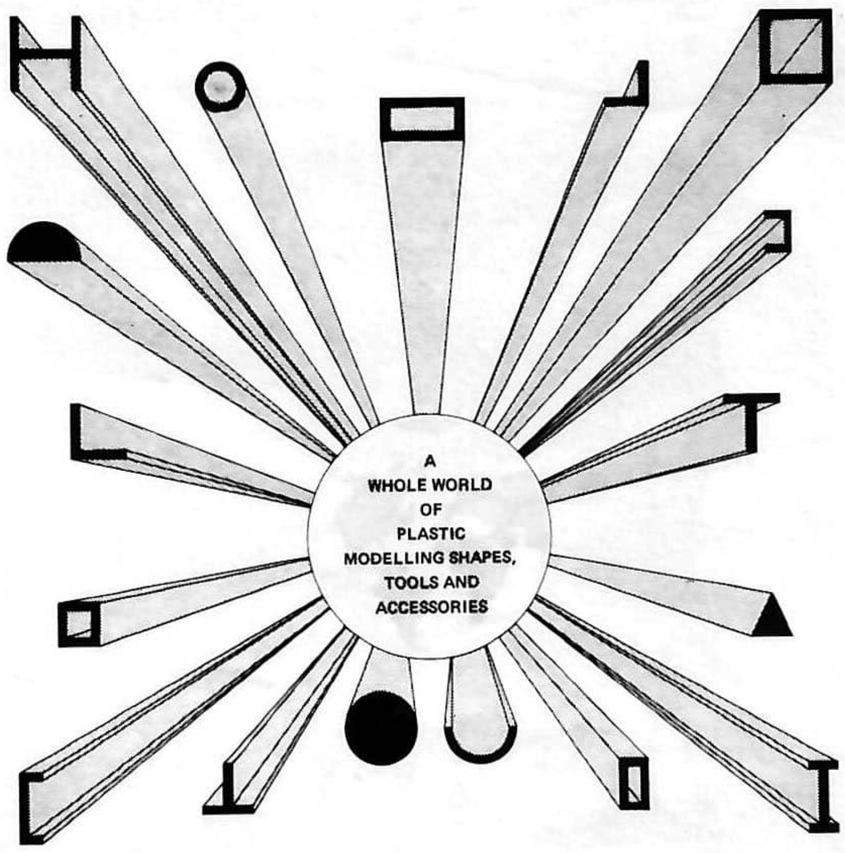

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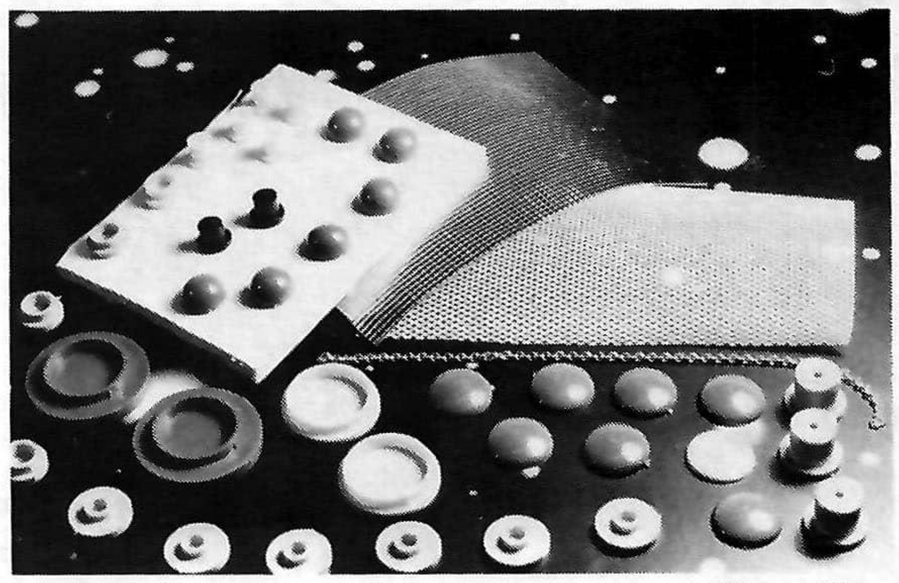

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CAPTAIN'S LOG

So many exciting developments have occurred in the wake of our premier issue, it's difficult to really know where to start. Firstly, let me thank all those readers who took the trouble to write in with so many kind remarks about the first edition. My reactions were a mixture of relief and satisfaction. The latter in particular, because the kind of features that excited our small team would also appear to have excited you, the readers, and I consider myself extremely fortunate to be in a position to present such fine material. Feedback from both readers and advertisers, here and abroad, has only served to reinforce my personal conviction that there *is* a real need for a high-quality *British* science fiction/fact magazine. The future prospects, therefore, seem bright and as the contents of this issue reflect, we're not exactly resting on our laurels.

That we can present such exclusives as interviews with Arthur C Clarke, and Harrison Ellenshaw, along with the first pictures from *Revenge of the Jedi* and heavy coverage of Steven Spielberg's *E.T.* all in one packed edition, has been the result of favourable media reaction to No.1. It is a trend I am pledged to uphold in months to come . . .

Space Modelling

Judging by our postbag, many readers appear greatly interested in the model aspect of science fiction and fact; recent articles on the **VEB** *Vostok* and **Airfix** *AT-AT* being enthusiastically received. But with so many plastic kit manufacturers suffering from recession these days, the outlook for new models is rather bleak. So I asked our Technical Editor, Mat Irvine, to suggest some subjects he would like to see kitted in the future if the commercial climate improved. Mat went one better, he conducted his own survey:

'I asked some friends who are as daft as I am and gave them the choice of two, one fictional craft, one factual. True to form not everyone gave a single answer to each, but for what it's worth here are the results.

'Of the factual craft, manned space seems to come top, with Jack Fouche, Geoff Weir and Ray Rimell wanting 1/100th scale full stack shuttles – Jack also tentatively suggesting a 1/72nd scale version as well. Brian Sampson would like a 1/48th scale *Salyut*, with clear panel and interior, while Jean-Christophe Carbonel is also after a *Salyut*, a *Soyuz*, and a *Progress*, but would settle for them in smaller scales. (Actually certain Soviet spacecraft are available as kits from the Moscow toy factory. Both *Soyuz* and *Vostok*, to 1/30th scale, definitely exist.)

'Stephen Corbett plumped for *2001*'s *Discovery* craft as his SF choice, and Skylab for the factual. Bill Pearson also decided on Skylab, a kit of which was rumoured by **Revell** but never materialised. Bill would also like, in the SF line, the original *Fantastic Voyage* submarine, the *Proteus*, and/or the George Pal Time Machine. Andy Yanchus also placed the latter on his list, and added Pal's Martian War Machine as well. He would like, in the real craft, an *accurate* 1/72nd scale X-15 with B-52 pylon (the Revell kit was *not* 1/72nd, more like 1/69th.) Other SF craft that came up were the *Liberator* – Ray's and Brian's suggestion – honestly, I did have a go at trying to persuade Airfix to produce a model. Jean Christophe would like one of the craft from *Battle Beyond the Stars*, and also added an SF book example, Duke Leto's car from *The Children of Dune.*

'Oh, and me? Well, the book example would be Arthur C Clarke's *A Fall of Moondust* and the moonbus *Selene;* SF would be the Discovery's Pods from *2001*, or maybe the *Aeries* from the same film. If it was a robot it would have to be a *Silent Running* Drone. For factual craft, there's no hesitation, *Lunokhod*, though if I were offered a Lunar Rover or a Viking Lander I wouldn't say no; the Rover, incidentally, was the subject of another rumour, this time from **AMT.**'

Meanwhile, if models do interest you, then this issue's features on the *Snowspeeder* and fantasy figure painting should provide further inspiration.

Namechecks

Apologies are extended to two of our contributors following publication of issue No.1 and I'm glad to set the record straight now after having mis-spelt the surnames of both Paul Clark and Iain Nicolson.

An additional 'hiccup' occurred in the caption on page 11 of the same issue; it's Bernal, not Bernel and Marion van der Voort has reminded me that the photograph of Anne McCaffrey (reproduced on page 73) should have been credited to Joe Sterling.

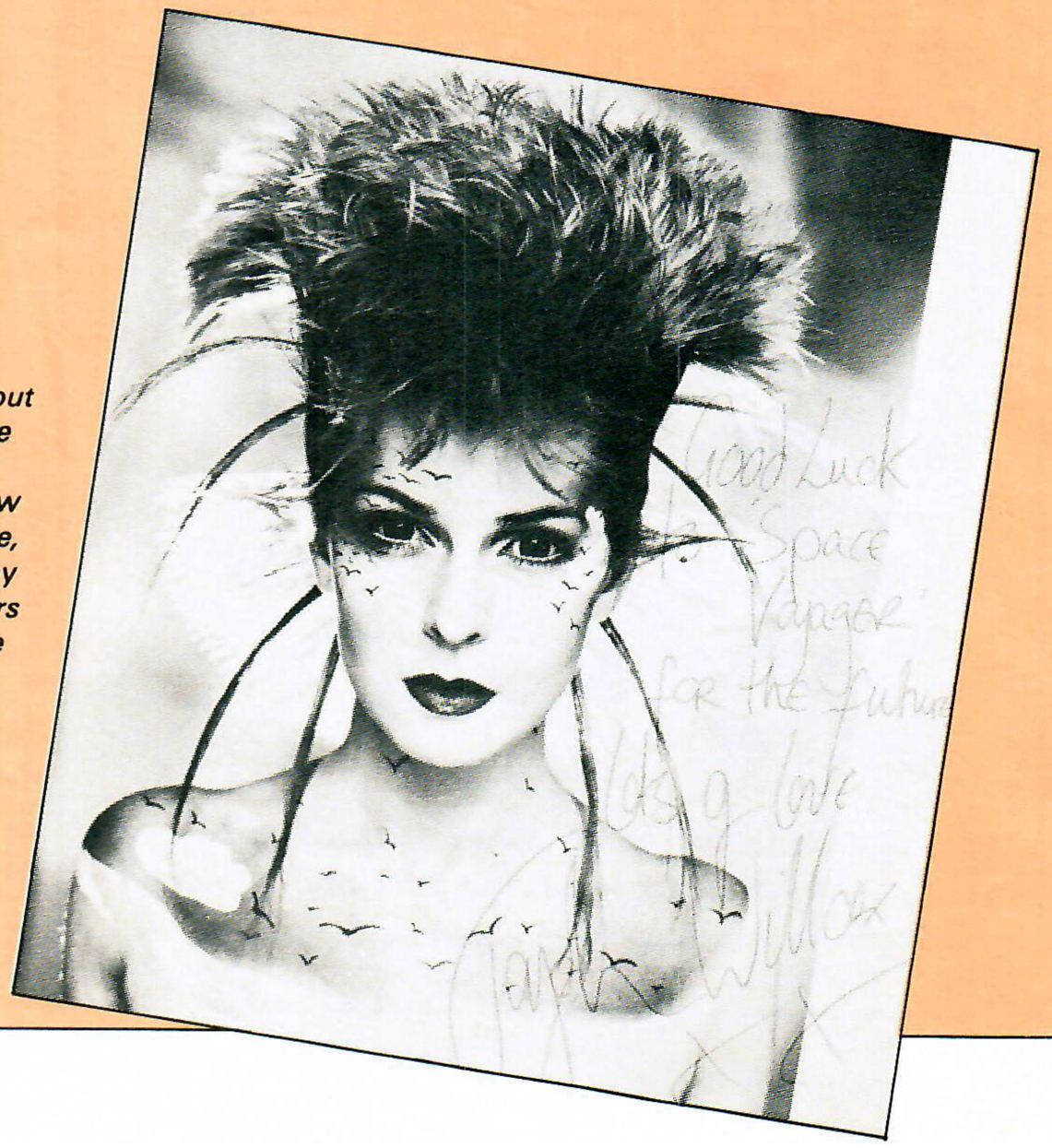
We also managed to change Tom West's (of **MPC)** name to 'Scott' in the **Products** section (page 78). Mat blames his obsession with Joni Mitchell records for this – one of her main musicians is the LA brass player Tom Scott!

Additionally we omitted the promised caption to the Dave Hardy painting on page 23, which should have pointed out that it came from Dave's new book, *The Atlas of the Solar System.* However, we hope we have made up for that with the review of his book in this issue

Blake's 7

We apologise to all *Blake's 7* fans who were expecting the second part of our episode guide to the popular TV show. Copyright and contractural problems with the BBC have prevented us from continuing the series in *VOYAGER* although, with luck, we have other plans for *Blake* in forthcoming issues.

Ray Rimell



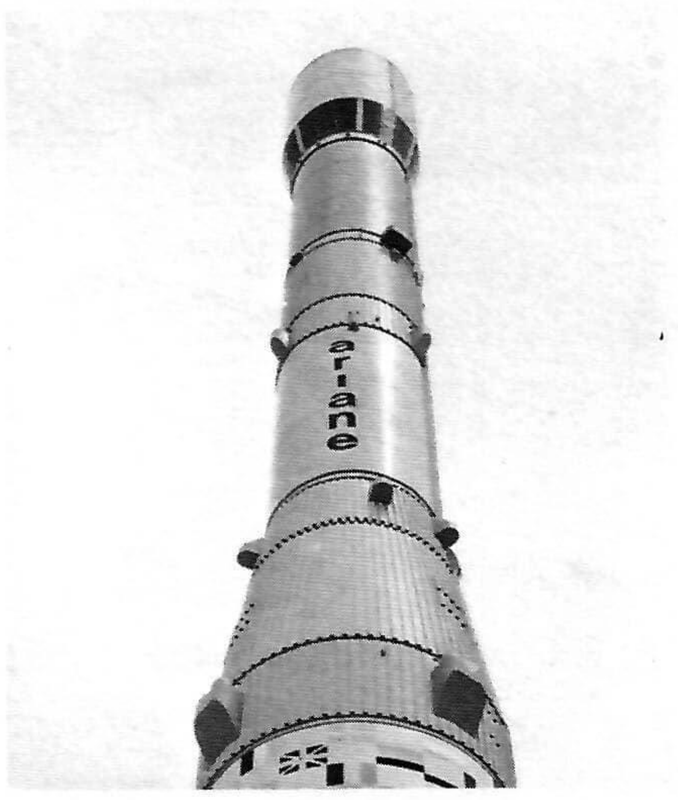
It's nice to have friends, part 2 . . . Above, Arthur C Clarke took time out of a busy schedule to grant us an exclusive interview for this issue while, right, among many of our well-wishers was this message from Toyah.

DATA BANK

NASA's ups and downs
It's the world's biggest yo-yo, unless you know anyone with a ten mile length of string. This particular 'toy' is part of NASA's Balloon Programme, run by the Goddard Space Flight Center at their Wallops Island base (where all the sounding rockets are launched). An instrumentation package is carried by balloon to very high altitude. There it is lowered into the atmosphere to take measurements, then bounced back to the balloon again, just like a yo-yo. A recent test in Texas used a 26 million cubic foot balloon which rose to 133 000 feet (25 miles), then lowered its payload down 40 000 feet (7.5 miles). Time on the downward journey was 27 minutes and on the return, 36.

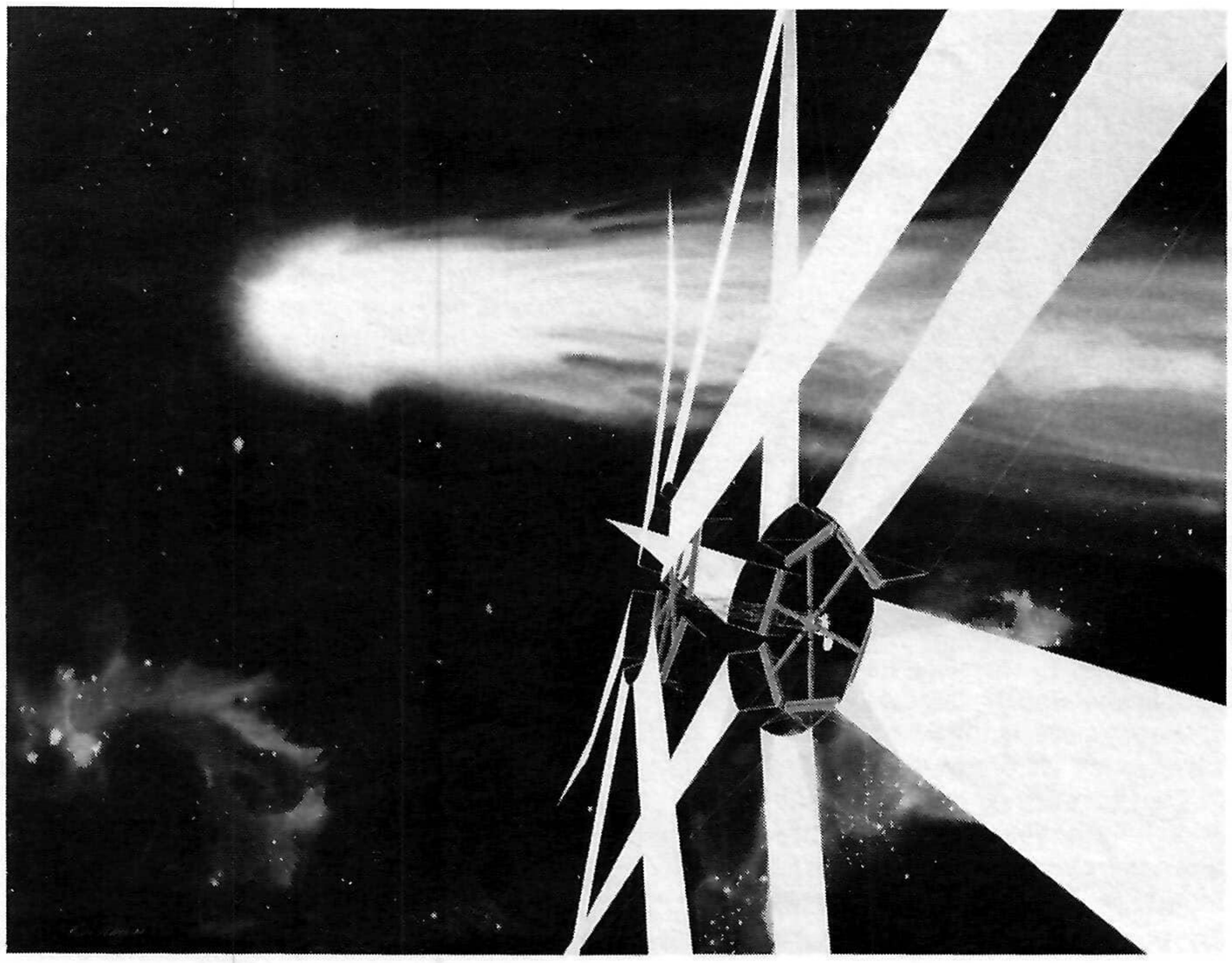
The idea, in practice, will be to lower and raise the payload up to 12 times, sampling the atmosphere at various times and altitudes.

Revenge of the Jedi novel
Coinciding with the premiere of the third *Star Wars* film in May, is publication of the *Jedi* novelisation by James Kahn whose most recent work, *Poltergeist,* was on the US best-seller list for several weeks in 1982. The author is a Ballantine/Del Ray (US) writer and his previous works include the fantasy adventure novel, *World Enough and Time,* first of a trilogy whose second title, *Times Dark Laughter,* recently appeared in America. In addition to his writing career, Kahn is also an emergency room doctor and served as a medical advisor on *E.T.* and, in consequence, was hired by Spielberg to write the *Poltergeist* novel.



Ariane problems
It remains to be seen if the failure of the fifth Ariane flight on September 10, 1982, has had a lasting effect on its viability as a commercial satellite launcher. Most Earth-orbit satellites these days are constructed with two launch options in mind, *viz,* the Shuttle, or an expendable launcher. Invariably, the latter would be Ariane, but the US does still have a number of expendable rockets, such as the Delta series, of its own.

Ariane launch L5 was lost when the turbopump that supplies fuel to the third stage engine failed.



Solar sailers
It's silent, graceful, and flies to planets for free. This, on the face of it, sounds like an offer no self-respecting space agency could refuse. But, of course, it isn't quite as easy as it sounds.

Solar Sailing is about as complete a description as you'll find. It's 'sailing' using solar energy as propulsion in exactly the same way as a yacht uses a sail to propel it through water. Sunlight – and, for that matter, any light – exerts pressure on whatever it falls. It's extremely tenuous and for all practical purposes on Earth, can be ignored. But out there in space, without the confines of direct gravity, air pressure, winds and 101 other things that disturb it, this tiny, but constant and free, source of energy can be harnessed.

Because it is so slight, the only way to capture such pressure is over a comparatively large area, and this is where a major problem rears its head. The solar sail itself has to be enormous to have any effect and with normal structures the larger they get, the heavier they get. Structures in free-fall conditions may not have any weight, as such, but they still have mass. Consequently, the solar sail needs to be large, but light, and therefore extremely thin. Present plans include very thin Mylar sheet, though more exotic processes, such as vacuum-plating (as it will be made in space) and aluminium over wax moulds, have been put forward. The sail itself can be of any shape – it's the total area that is the important factor. Square or circular are logical approaches, but to maximise the solar sailing effect, and to combat practicalities in keeping the structure rigid, more elaborate designs have been envisaged. One of the most fantastic is the windmill-inspired Heliogyro. Here, two sets of rotating solar sails could propel a payload across the Solar System, and would be suitable for missions such as comet interceptions.

The French U3P Society have proposed a 'race to the Moon' with solar-propelled craft. Attractive as the plan appears, no-one took up the idea and it was fraught with impracticalities anyway. No-one had built a solar sail, let alone flight-tested one. However, the Californian-based World Space Foundation decided to go ahead with the practical side of things and are well on the way to building a working prototype. Ironically, they have no method of launching it as the Shuttle is booked. So they turned to the Europeans for help; initially through the British Interplanetary Society and later through the U3P. Ariane would have been available, but ESA felt it could not launch a US satellite for free – however worthy the cause. But U3P have gone ahead with plans and have produced a one-tenth scale mock-up of a solar sailing craft, albeit modest in size, but workable in theory. In addition, the BIS, besides co-operating with fellow societies, have their own solar sailing technical committee.

There is another side to solar sailing which encompasses another aspect not usually associated with astronautics. A solar sailing craft could be an ideal leisure and sporting spaceship. It has already been said that it works very much like a waterborne ship, and can tack and manoeuvre in similar fashion. Arthur C Clarke, in fact, used this idea in his novella, *The Wind from the Sun,* and perhaps solar sailing regattas are not too far-fetched an idea. Maybe the aim should be for a Manned Solar Sailing Race to the Moon?

Further reading
Spaceships of the Mind by Nigel Calder. BBC Publications.
The Wind from the Sun by Arthur C Clarke. Gollancz.
Spaceflight Vol.24, No.3. March 1982. BIS.

DATA BANK

Professor Alec Boksenberg, director of the RGO at Herstmonceux, and Heather Couper.
Photo: Mat Irvine.

The FAS and the RGO
Report by Robin Scagell

For years, British amateur astronomers have cast envious eyes across the Atlantic where amateurs regularly hold large scale conventions. But last October, over 300 people attended the largest UK astronomical convention ever at the Royal Greenwich Observatory at Herstmonceux in Sussex.

The proceedings were organised by the Federation of Astronomical Societies, and the delegates were treated to a wide range of attractions. For much of the time there were two events taking place simultaneously, giving people a hard choice. Should they listen to Heather Couper's talk on our Galaxy, or see Mat Irvine, his wonderful collection of models and to hear of their use on television? (I know who *I'd* rather go and see, and it's not me! **MI.**) Or maybe hear Paul Murdin's account of recent professional work, instead of listening to the RGO's Director Professor, Alec Boksenberg, being 'grilled' in an interview by the writer.

Other highlights included a demonstration of holography by Nick Phillips of Loughborough; Ian Ridpath's description of Life of Earth which featured those fascinating details no-one else ever tells you, like how astronauts go to the loo . . . (Trust Ridpath to get down to basics! **MI.**) There was also an imaginative 'Desert Island Slides' in which noted observer John Larard talked about his favourite astronomical objects and an astronomical sound and light show by Geoff Pearce.

To add to the choice, there were guided tours around the Observatory's telescopes and computer centre, including the Herstmonceux mode of the Starlink System, which links computers in six of the UK's major astronomical institutions so that data can be shared. There were also competitions for slides, paintings and telescopes and trade exhibits where the amateur astronomer could find virtually everything from telescopes to specialised films and developers. There were even some amazingly realistic white light holograms for sale.

Rounding off the very full day, Professor Boksenberg gave a detailed account of the running of both the RGO and La Palma, the new international observatory being set up in the Canary Isles. He showed pictures of the buildings in progress and also on a video monitor, showing new techniques in computer analysis that brought out details in astronomical photographs that might otherwise be missed. Besides the efforts of the FAS, which is playing an increasing role in British amateur astronomy, the success of the convention must be due to the co-operation of the Royal Greenwich Observatory itself, which has shown a welcome change in attitude in recent years. Not so long ago, such a convention would have been unthinkable at Herstmonceux. There was little fraternization with amateurs, or the public in general, who might get in the way of the serious work of the astronomers. But now, thankfully, there is a

SHUTTLE NEWS

Space Shuttle – the fifth flight

The fifth flight of *Columbia* can safely be termed a success even though the planned space-walk did not take place.

Launched to the minute at 12.19 GMT on November 11, STS-5 was the first operational flight of the shuttle system – the first four being deemed test flights – as it was the first flight to carry a commercial load. The load in question was two communications satellites – Satellite Business System's SBS-3 and the Canadian Anik 3. Both are built by Hughes and are essentially the same design. Both were fitted into the payload bay of the Shuttle on cradles designed to rotate the satellite, once ready for ejection, and to push it, by means of springs, out of the cargo bay. Once clear, the attached Payload Assist Module fired its rocket engine to propel the satellites to the much higher geostationary, or Clarke, orbit. Both satellites – as TV viewers around the world witnessed – were dispatched perfectly, SBS-3 first, a mere eight hours after the launch, and Anik two days later.

The part of the mission that did not occur to plan was the proposed ExtraVehicular Activity, the space walk. The flight carried, for the first time, four crew members and besides Commander Vance Brand, who flew on the *Apollo/Soyuz* mission in 1975, and the Pilot, Robert Overmyer, two Payload Specialists were also aboard. Drs William Lenoir and Joseph Allen flew in the latter capacity and besides duties attached to the despatch of the satellites, they were due to don the new-style Shuttle spacesuits (above) and space-walk into the payload bay to carry out a number of experiments. They were not directly related to this flight but the techniques will have to be perfected at some stage; later missions plan for repairs to be made to satellites in orbit and NASA has to discover just what the problems are related to working with equipment and tools in free-fall conditions. The space-walk was initially posponed as Bill Lenoir developed space sickness early in the flight, and the EVA was delayed a day. However when this finally arrived, both spacesuits were discovered to have faults and could not be risked. They are a new design from the older style space suits NASA previously used. Firstly they are self-contained and do not rely on the umbilicals of the Gemini/Skylab type. Secondly, they are the new generation of suits in that they are not custom made for each individual astronaut. Instead each is fitted from a selection of 'off the peg' parts.

The fault with the suits is potentially serious as it could delay the next flight if the problem cannot be traced. *Columbia* played her part extremely well, being launched and safely returning five times to date. She is now being temporarily grounded while modifications take place, and the sixth flight will see the launch of the second Orbiter – OV-099 *Challenger*. *Columbia* is due to return in September with STS-9 and the first flight of Spacelab.

Waste not want not

The Space Shuttle Transportation System is designed to be recoverable and re-useable; well, most of it. The Solid Rocket Boosters are also designed to return so as to be refurbished and assist yet another launch into the cosmos. Sometimes they return and disappear into the depths, but the thought is there. In fact, the only bit of the Shuttle system that isn't destined for greater things is the largest single item, the External Tank or ET. (ETs don't necessarily consume the contents of a refrigerator or ask to phone home . . .) The Shuttle's ET is a large tank containing the fuel that supplies the main engines. At present it performs this vital role and is jettisoned just before the Orbiter attains orbit. The ET falls back into the atmosphere and becomes a momentary fireball as it burns up.

It's rather a waste, but Martin Marietta, who build the tanks, have other plans. It would not take much modification to carry the ET into orbit. As it is, the Orbiter is at 98% of its orbital velocity when the ET is jettisoned and the SSMEs shut down. Normally, the smaller Orbital Manoeuvring System engines are used, but if the ET remains attached, the SSMEs can continue working and they are more efficient engines. The Orbiter can even carry 2000lbs of

growing awareness amongst the professionals that the public have a *right* to see what goes on inside such institutions; after all they provide the funds. Good PR can help enormously when it comes to obtaining grants and there is now a genuine willingness among astronomers to help others enjoy the subject.

Plans for future conventions have not, as yet, been fixed and although Alec Boksenberg said that the FAS will be most welcome to hold another gathering at Herstmonceux again in 1983, he agrees that it would be a good idea to visit other appropriate sites. Maybe the 1983 convention will be at Cambridge or Jodrell Bank?

For further details about the Federation of Astronomical Societies, contact the secretary, Mrs Rosemary Naylor, FAS, 24, Julia Crescent. Stonebroom, Derbyshire, DE5 6LS, enclosing an SAE.

PUBLISHERS' NOTE

To those who are unaware, The Royal Greenwich Observatory is the overall body that runs both the original site at Greenwich in London, and the site at Herstmonceux, Sussex. Presumably it will also take on the name of Royal Greenwich Observatory, La Palma.

Comet Encounters

It seemed that the USA was out of the race to intercept Halley's Comet, and actually they still are. But it seems likely they could be ahead on points as far as comet interception in general is concerned if a current plan is successful.

The target is Comet Giacobini-Zinner, not as famous as Halley, but due in Earth's vicinity sooner; about six months sooner. And what is more, the US will not have to launch a new probe. The European, Japanese and Soviet plans all call for a new spacecraft to be launched specifically for the Halley mission, but the American craft is already in orbit. It is the ISEE-3 probe, The International Sun-Earth Explorer. It is already 'going where no satellite has gone before', in a highly eccentric orbit encompassing both Earth and Moon. The diversion to the comet in 1985 will, in fact, curtail ISEE-3's mission, but NASA reckons this is worth the loss for the potential gain and, in any rate, will possibly save $5 million in tracking costs.

Manoeuvring of ISEE-3 for its 1985 encounter will begin next February when the probe will be nearly at its furthest point from Earth – nearly a million miles and travelling along the wake of Earth – an area largely unexplored. More corrections will eventually put ISEE-3 into an extremely elliptical orbit that will take it as low as 60 miles above the lunar surface. This will give the craft the maximum gravitational assistance, the 'sling-shot' technique used by Pioneers 10 and 11 and Voyagers 1 and 2, to literally fling the probe towards the comet.

If all goes to plan, ISEE-3 will encounter Comet Giacobini-Zinner on September 11, 1985. It does not carry cameras, so no imaging is possible, but six of the instruments should be able to give scientists data on temperatures and composition of the comet's tail. And perhaps ISEE-3 will even get to see Halley. After the primary encounter, the probe will be well-placed to participate in the International Halley Observation Programme, by analysing the solar wind before it reaches Halley's Comet.

additional payload.

Having got the External Tank into orbit, what use is it? Martin Marietta think it has a great deal of potential. Firstly it has industrial and scientific application – even if this is only as a source of materials, particularly aluminium. It could also be used as a giant Cosmic Ray Detector, by filling it with a luminescent gas that becomes fluorescent when struck by high energy rays. A third use would be as a 'Faraday Cage'; basically, a magnetically-clean laboratory in free-fall condition, not easily possible on Earth.

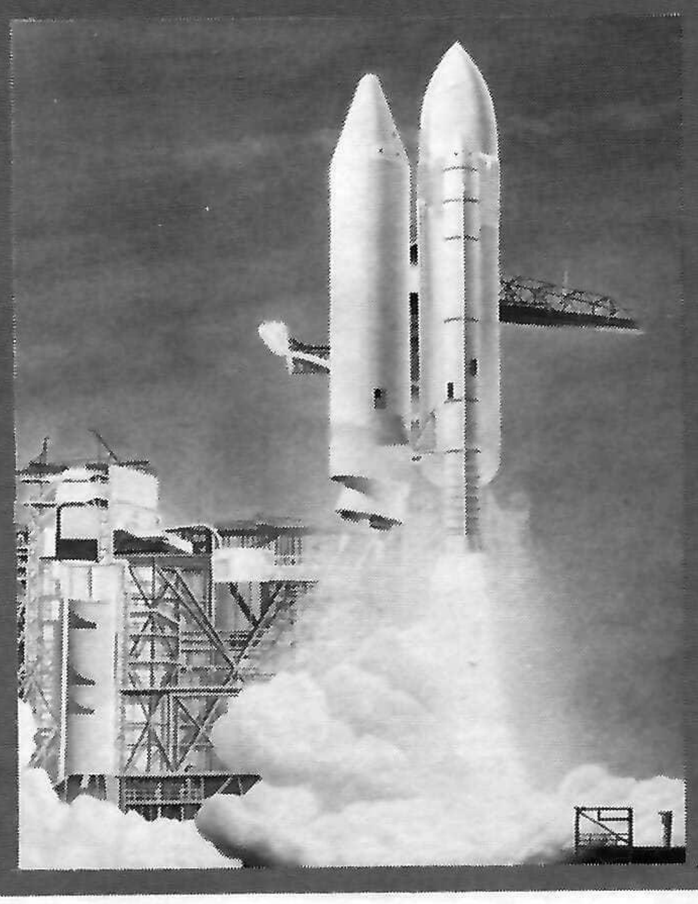
The tank can also be used as a carrier by adding a section at the rear of the ET that would provide a second payload area. This would more than double the present payload area, giving an additional 13 000 cubic feet (as against the Orbiter Payload Bay's 10 600 cu.ft.) There is an added bonus that this new area increases the width of possible payloads from 14 to 25 feet. Ideas for loads could be Spacelab modules, electrical power generators, large space structures and, probably of most use, the Orbital Transfer Vehicle. This is a small tug whose uses are only limited by one's imagination. It can be used to manoeuvre payloads around the Shuttle and to orbiting facilities, and to propel satellites to geostationary orbit.

A third aspect of ET utilisation is as a space facility. The tank can be used as a 'strongback' on which other structures can be built: large antennae, space telescopes, solar power collectors and the like.

The interior of the tank contains over 50 000 cubic feet and could be adapted as a hangar and provide a protected area where maintenance of satellites and vehicles can be carried on in a 'shirtsleeve' environment. This interior can also, of course, be adapted for living quarters. Floors could be fitted and up to 16 crew accommodated. By comparison, Skylab's workshop volume was 10 500 cu.ft. so an ET would give five times the space.

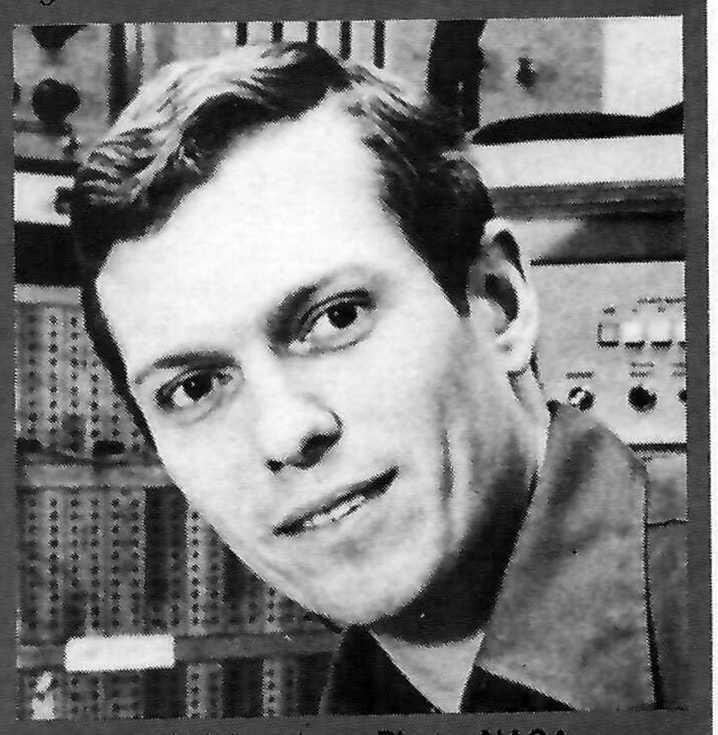
More Shuttle flights would bring more ETs into orbit and the Space Facility would grow into a permanent space-station. Not a bad ending for a piece of hardware that was designed to be thrown away in the first place.

More than 150 000 lbs. of cargo could be put into low Earth orbit by this 'shuttle-derived' vehicle using an unmanned cargo carrier. Photo: Martin Marietta.



Spacelab crew named

Both prime and back-up payload specialists for the first Spacelab flight have been named. Prime crew will be the German physicist, Ulf Merbold, and America's Dr. Byron K Lichtenberg, who is a Biomedical Engineer. Back-up crew is the Dutch physicist Wubbo Ockels and American Dr. Michael L Lampton. The latter will be just as involved as the Prime crew, and will be an important element on the ground. The first Spacelab is due to be launched on the STS-9 Shuttle, scheduled for September 30, 1983. The remainder of the crew will be Owen Garriott (who flew in Skylab 3, the second manned flight) and Bob Parker as mission specialists, plus Brewster Shaw as the pilot. The mission will be commanded by John Young, who helmed the first Shuttle flight.



Dr Byron K Lichtenberg. Photo: NASA

DATA BANK

TDRSS satellites

That unique circle around the Earth known as the synchronous geostationary or these days, more appropriately, as the Clarke orbit, is filling up with communication satellites. As their period – the time it takes to orbit around Earth – is exactly the time Earth takes to revolve around its axis, the satellites appear stationary to an observer. The satellites themselves have come a long way from the first comsat and regularly handle the majority of intercontinental communications traffic. However, now they are to be joined by a comsat that will make many of the others pale by comparison. In fact it's more than a comsat, it's a whole communications system allowing data to be exchanged not only from ground station to ground station, but also between the Shuttle and Earth and other unmanned satellites. Called the Tracking and Data Relay Satellite System it has been developed by the Californian-based company, TRW. Eventually the complete system will comprise four such satellites and the ground station at White Sands in New Mexico. The whole ensemble will be owned and operated by Spacecom – The Space Communications Company – itself a partnership between Western Union and the American Satellite Company.

The TRDSS satellites are large. Measured along one axis, from solar panel to solar panel, the length is over 50 feet. The other axis is dominated by two giant 16 foot diameter antennae, themselves examples of advanced space technology. They go into orbit furled, but once deployed, 16 supporting ribs stretch over 20 square feet of extremely fine gold-covered molybdenum wire mesh into a glittering reflector surface. The material is so fine that it is woven in exactly the same way that stockings and tights are made. A third, steerable, antenna is positioned in between, and a further four antennae systems cover such a wide range of frequencies that up to 100 separate spacecraft can be contacted; up to 32 of them simultaneously.

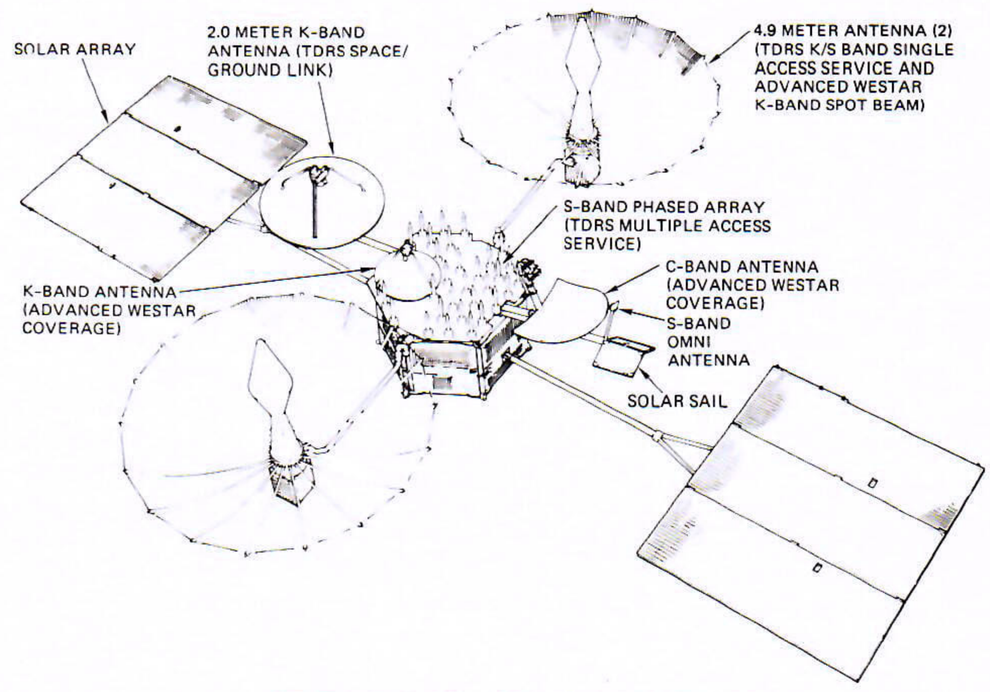
Of the various frequency bands used in spacecraft communications, the K Band is the most common. Each TDRSS has two K-Bands, each of which has the capability of dealing with 300 million bits (binary information) per second which, given that a single letter character requires eight bits in composition, means that the satellite can cope with 140 volumes of an encyclopedia every second. However, mind-boggling as this is, no physical printer can work at anything like this speed (not even ours!) but this ability will come in useful for Earth resource-type pictures.

The satellites will operate through a new ground station being built at White Sands. All commands will originate from here, including most of the control systems. This is unusual (they are usually aboard the craft itself), but this has been done to limit the amount of equipment on board the satellite to the absolute minimum and thus extend its reliability. The TDRSS satellites have a planned life of ten years apiece which, judging from present systems, means they should last much longer.

NASA will lease two TRDSS satellites from Spacecom, used to relay data and commands from satellites and the Shuttle. A third will be used by Spacecom for commercial communications satellite services, and the fourth will be in orbit as a spare for both organisations. In addition, two more will be ground-based for immediate launch.

Launch will be from the Space Shuttle, the first one being due this month (January) on board the maiden flight of *Challenger.* The Shuttle climbs to around 150 miles altitude, then releases the satellite. It will be attached to the Inertial Upper Stage – the equivalent of an expendable booster's third stage – which will take it up to the 22 250 mile orbit.

One of the four giant tele-communication TRW satellites which comprise the space segment of the Spaceco Co , owned-and-operated TDRSS. NASA will lease tracking and data relay services for its fleet of Earth-orbiting spacecraft – including the Shuttle.
Illustration: TRW.


SOLAR ARRAY
2.0 METER K-BAND ANTENNA (TDRS SPACE/ GROUND LINK)
4.9 METER ANTENNA (2) (TDRS K/S BAND SINGLE ACCESS SERVICE AND ADVANCED WESTAR K-BAND SPOT BEAM)
S-BAND PHASED ARRAY (TDRS MULTIPLE ACCESS SERVICE)
K-BAND ANTENNA (ADVANCED WESTAR COVERAGE)
C-BAND ANTENNA (ADVANCED WESTAR COVERAGE)
S-BAND OMNI ANTENNA
SOLAR SAIL
TDRSS/ADVANCED WESTAR SHARED SATELLITE

Franco-Soviet flights

Following the successful flight of a French 'Euronaut' to *Salyut 7* in mid-1982, there is always the possibility of a second Franco-Soviet mission. France has had many close links with Soviet space activity, including the design of instruments used aboard *Venera* craft and *Lunokhod.*

Jean-Loup Chretien flew on board *Soyuz T6* in June, 1982, with Patrick Baudry as back-up. It is more than likely that future flights would involve either, or both, men as this would cut down the training time necessary for new flights.

Comet capers

Halley's Comet is not due into the near-vicinity of Earth until 1985/6, but telescopes already have a sighting, way out near the orbit of Jupiter.

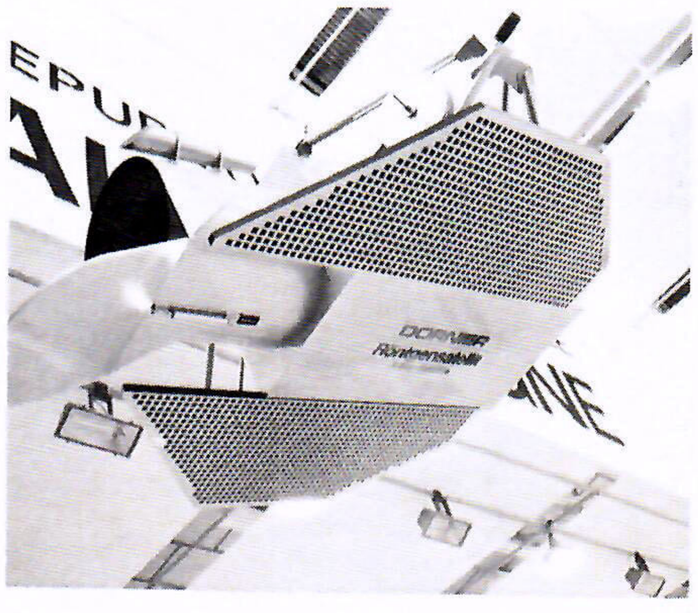
As this will be the most well-documented return of a comet ever, a great deal of effort has gone into making sure the scientific institutes of the world know what each of them is doing. With this aim in mind the 'International Halley Watch' was formed last August. Led by Ray Newburn of the Jet Propulsion Laboratory and Jurgen Rahe of the Remis Observatory in Germany, its aim is to co-ordinate all observations, both professional and amateur. These can then be compared with the comet's last return of 1910 which, even though it was at the beginning of modern technological astronomy, was very well documented.

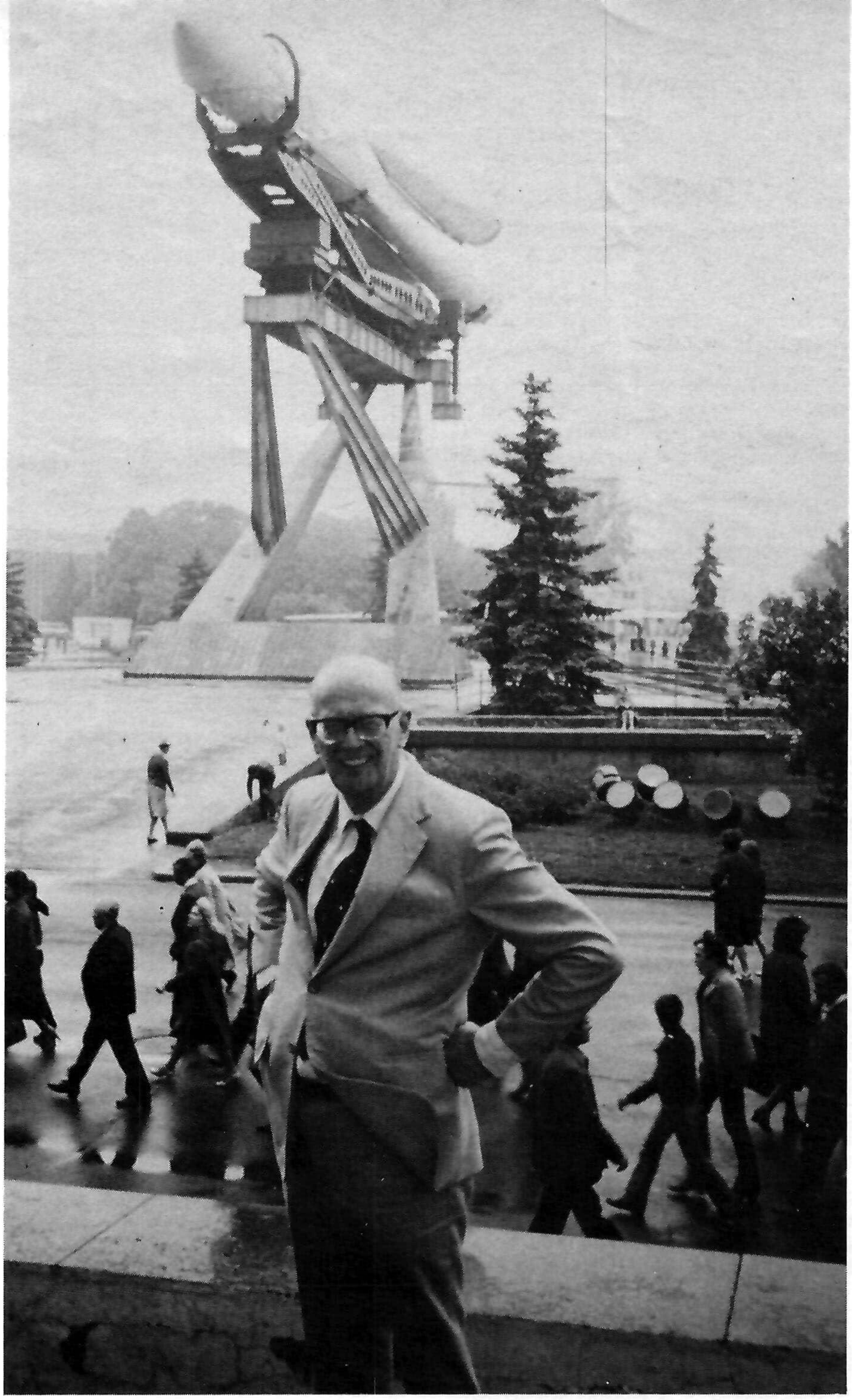
Soviet record

November 15, 1982, saw the Soviets pass their previous endurance record of 185 days in orbit and give clearance – at the time of writing – for a further 60 days.

ROSAT

Germany are planning the *Roentgensatellit* (ROSAT) designed to study X-Rays from objects outside the Solar System. The satellite is being developed by Dornier and is planned for a 1987 launch. Instruments to be carried include a German-built X-Ray telescope, an American high-resolution imaging detector and a British wide-field camera.





ARTHUR C. CLARKE

THE CELEBRATED AUTHOR OF 2001, AND NOW 2010, TALKS EXCLUSIVELY TO *NEW VOYAGER.* INTERVIEW BY MAT IRVINE.

I first met the Clarke family many years ago when I was working in North London, actually at Alexandra Palace for the BBC Open University programmes.

I was introduced to a Mr Clarke, who had a great interest in the Palace, and had come into the reception area of the BBC end where he had spotted some astronomical-type models we had on display. This Mr Clarke turned out to be Fred Clarke, one of Arthur's two brothers, who still lived in the area.

The interest in the models was because Fred was about to organise a Space Age Exhibition and was looking for exhibits. From this the Astronomical Society of Haringey was born with Arthur as Patron and Fred, initially, as Chairman, and now given the standing post of President.

Arthur, of course, lives in Sri Lanka, making only irregularly-spaced visits to this country. For many years the North London home of Fred was his base; a place that had many of the elements of Fawlty Towers, especially as one was never quite certain as to what was going to happen next . . .

However, a few years ago, Fred decided to move back to the Clarkes' original roots in Somerset, where the other brother, Michael, still farms. He bought a rambling mansion called Dene Court near Taunton complete with hot and cold running rain! The place was badly in need of attention.

I've only recently managed to visit the house and am pleased to report that transformations have taken place. It was on this visit, last August, that I talked to Arthur C Clarke while he attempted to relax after a gruelling, but very pleasant, few weeks tour of Europe. A visit to the Soviet Union had taken up most of his time, followed by attendance at the Unispace conference in Vienna. First, however, was an invitation to The Netherlands and The Hague to receive the Marconi Award or, to give it its full title, The Marconi Fellowship for Communications, Science and Technology. This is the eighth such award instigated by Mrs. Gioia Marconi Braga, daughter of the radio and communications pioneer.

The ceremony took place on June 11, 1982 in the Grand Hall of the Knights, the trophy being presented by HRH Prince Claus of the Netherlands. I spoke to Arthur about his itinerary . . .

VOYAGER: *With regard to your European visits in the middle of the year, you had a fairly hectic time?*

Arthur C Clarke: It certainly was. I went to The Hague for the Marconi Award, then on to Moscow from that, went back to Columbo for a few days, and then back to Vienna for the Unispace '82 conference. I was there for ten days as a member of the Sri Lanka delegation and also as one of the speakers. I spoke on 'Space Travel – Imagination and Reality.' I did a long paper which I hope will be published widely in due course.

V: *This was the second Unispace Conference?*

ACC: The second one. The first was in 1968 and I was at that.

V: *The first one was supposedly only for the 'developed' countries?*

ACC: Well, the first was really at the beginning of the space age, but everyone was there. Of course, the Apollo Programme was well under way then and, in fact, the Chairman of the first conference

started the Indian Direct Broadcast Satellite Programme and his successor is Secretary General of this conference, Professor Yash Pal. Yash Pal won the Marconi Award two years ago and was also at the Hague for my ceremony.

V: *Was there more emphasis at Unispace on the third world countries?*

ACC: Very much so, and the space-faring powers were rather on the defensive. When the subject of the militarisation of space came up they wanted to avoid discussion of that, but in fact everyone insisted on it. This is why I got involved and I'm going to Geneva to discuss it. *(Arthur had been invited by the United Nations to address them in Geneva the following week.)*

V: *How do you see things for the developing countries? Are they getting shut out of areas, particularly with regard to the geostationary orbit which is rapidly filling up with comsats in key areas?*

ACC: That is another question – the ownership of positions in the geostationary orbit. It is a problem, but nothing like as serious as the militarisation of space and the anti-satellite missile projects which are going ahead now, which is what particularly concerns me at the moment.

V: *With regard to the geostationary orbit, you used the idea of the Space Elevator in 'The Fountains of Paradise'. When you were in Moscow you were able to meet the co-inventor Yuri Artsutanov.*

ACC: He was, in fact, the inventor.

V: *You were not aware of this at the time, you invented it separately?*

ACC: In fact it was the Americans who invented it separately and there have been three or four people who have invented it independently now. Incidentally, Paul Birch at Jodrell Bank has worked out a system of a Space Elevator from low orbit and from any latitude.

V: *Turning to your latest book and the long-awaited sequel to 2001, the first question has to be, of course, what prompted 2010? Did you want to find out what happened, or did you think the readers did?*

ACC: Both. A couple of years ago, as a purely intellectual exercise, I wrote a six to seven page outline of a sequel and sent it to my agent, thinking he would probably send it to *OMNI* or someone and I could forget it. He said 'No, you've got to write a book', and I realised he was right. I did, indeed, want to know what had happened and then I sat down to write. Then I got a word processor, which made a total difference to my life – I can't imagine ever living without one – it went very smoothly on the whole and everyone is completely delighted with it. I think it is maybe my best book.

I should explain that unlike *2001*, which was written entirely to provide a medium for the movie, this was written purely as a novel. I didn't spend one second thinking about a movie. In fact I said, half jokingly, I was trying to write a book even Stanley Kubrick cannot film 'cause there's no such beast' – but if anyone wants to film it, that's fine by me.

V: *Has there been any indication at all of a film?*

ACC: I know everyone seems after it, but I don't even want to know.

V: *No collaboration with Stanley Kubrick again?*

ACC: Oh, I talk to Stanley a lot, but any film deal is entirely a matter for my agent. I wouldn't get involved with it.

V: *In the brief extract I have had a chance to read (at the time of the interview) I notice you've involved the Soviets – was this a conscious effort to try and strike a balance?*

ACC: Very much.

Russian interlude

After the Hague visit, Arthur travelled to the Soviet Union, surprisingly, for the first time. Arriving on June 14, he met Counsellor Chetty of the Sri Lanka Embassy; his Soviet publisher, Vasili Zaharchenko; translator, Oleg Bitov and his guide and interpreter for the visit, Svetlano Prokhorova. (The latter apparently referred to herself as his 'slave-driver'!)

June 15 took in the gigantic Exhibition of Economic Achievement with its 50 pavilions. Main attraction has to be the Kosmos Pavilion with the full-size *Vostok* launcher mounted outside. Next came a 50km journey to Zvezdny Gorogok – the 'Stellar Village'. Arthur had heard that his old friend Alexei Leonov (the first man to perform a space-walk, and one of the Apollo-*Soyuz* crew) would not be there as he was at Tyuratam (Bailkonur) for the then forthcoming Soviet-French mission. However, Leonov *was* waiting to greet Arthur and to escort him on his tour. Gifts were exchanged and Arthur received a new book of paintings Leonov had just completed with fellow artist Andrei Sokolov.

A visit to the centre's cinema, and a showing of the life of the premier cosmonaut, Yuri Gagarin, was followed later that day by a visit to Gagarin's own office left exactly as it was at the time of the aircraft crash that killed him. Even the clock sombrely recorded the actual time.

The *Soyuz-Salyut* trainers were visited, only recently vacated by the latest crew waiting for lift-off. Arthur also had the opportunity of trying on an EVA space suit, an action which caused much hilarity.

Last stop that day was Leonov's own apartment where Arthur lunched with the family. At this point Arthur revealed that most of the action of *2010 – Odyssey Two*, takes place aboard the spaceship 'Cosmonaut Alexei Leonov'. Alexei was obviously delighted and,

ARTHUR C CLARKE SNIPPETS

Oleg Bitov, who translated Arthur's last two books, had run into problems when translating *Rendezvous with Rama*. 'What', he asked plaintively, 'is a blivet? I can't find it in any dictionary.' Arthur explained casually that, 'it's exactly the same as a gubbins' . . .

●

A recent report from The Jet Propulsion Laboratory indicates a powerful, unexplained radio source from an area in Saturn's D-ring. Maybe *2001* was right after all . . .

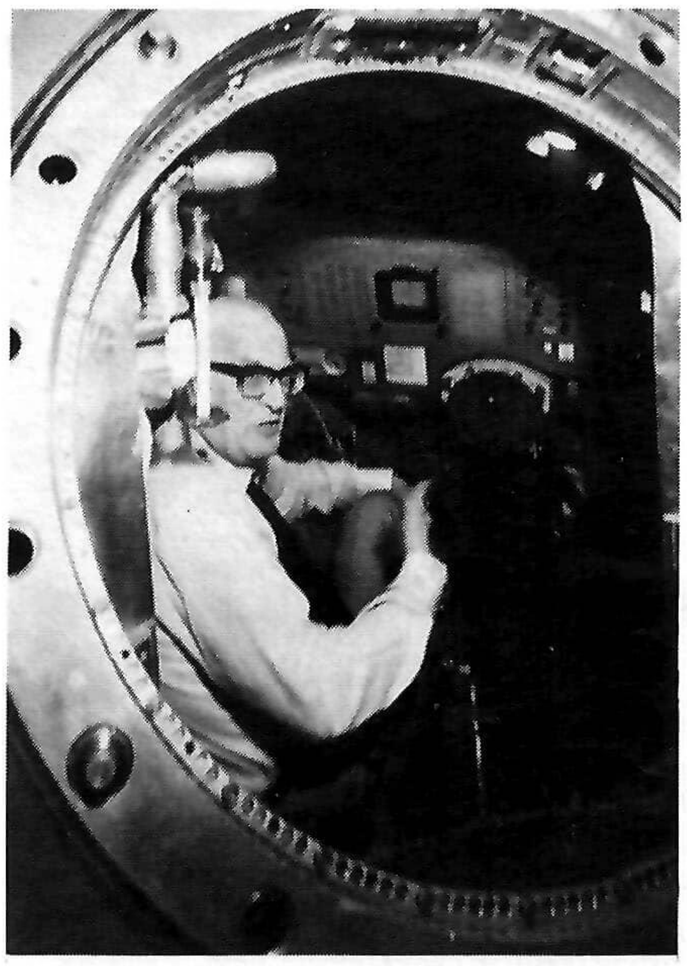
●

'In Leningrad there occurred one of those trivial little incidents that do so much to determine a visitor's impression of a new country. Wherever we went, people were always staring at our official limousine, doubtless wondering what big-wig was riding inside. I found this rather oppressive, so was delighted when a policeman stopped the car and bawled out the poor driver for no apparent reason. "He's bored and wants something to do," explained my hosts. "Anyway, it proves we're a democracy." I gladly conceded their point – at this level, anyway.' *Arthur C Clarke. August, 1982.*

●

***Arthur Clarke has taken his first acting role in a film. He plays the writer Leonard Wolfe and the film is based on the latter's book The Village and the Jungle.* The film is in Sinhalese and has been bought by the BBC for screening at a later date.**

Arthur C Clarke meets Beregoui on his visit to Zvezdny Gorogok, 'The Stellar Village', where he was also greeted by Alexei Leonov – now immortalised in Arthur's new novel 2010. Also in the picture, Soviet publisher Vasili Zaharchenko (left) and interpreter Svetlano Prokohova. Photo: via Mat Irvine.



Above, Arthur tries a Soyuz/Salyut trainer for size during his visit to 'The Stellar Village'. He also found time to don an EVA spacesuit. Photo: Mat Irvine.

via TV, most of the Soviet Union heard his reaction. 'Then it must be a good ship!'

Next location in the Soviet whistle-stop tour was Leningrad with tours around the Gas Dynamics Laboratory museum, with its exhibits of Soviet rocket engine development; a talk to the local writers' union with slides on Sri Lanka, and a visit to Czar Peter's country estate which, with its famous gilded statues and fountains, was invariably referred to as 'The Fountains of Paradise'. And, of course, the Heritage Museum. Arthur spent an hour there, viewing what could have only been a small percentage of the two million exhibits, staggered out, reeling with culture shock and coined a new verb. 'I've been Heritaged!' he explained.

By Friday June 18, it was back to Moscow for two conferences. One was at Intersputnik (which is the Eastern Bloc countries' space agency) and the other with Ministry of Posts and Telecommunications where Arthur explained, yet again, in his own words, his somewhat anomalous position as a British citizen, 'unofficially assisting Sri Lanka on a private visit arranged by my Russian publisher. I hope it made sense to them, it didn't always to me!'

Sunday 20 was the last day of the visit and Arthur was taken by Vasili and Svetlano to meet Academician Sergei Kapitza, son of the famous protègè of Ernest Rutherford, Peter Kapitza. Professor Kapitza hosts a TV series, rather like a cross between Patrick Moore and Carl Sagan, and Arthur recorded an hour-long interview. Both also recalled their scuba diving days along the Great Barrier Reef. Arthur points out that Academician Kapitza was the only Soviet he met with no trace of an accent when speaking English but, as Kapitza stated, he was born in Cambridge. Arthur added that many an Englishman would therefore say that he *did* have an accent!

Arthur C Clarke left the Soviet Union at three am on board an *Aeroflot* flight to Columbo. Two surprises came just before take-off. One was a call from Alexei Leonov on his way to the launch site, wishing him Bon Voyage, and the second from translator Svetlano who presented him with a poem she'd translated and told him 'You're not a bit like an Englishman', which Arthur reckons was her ultimate compliment.

V: *Returning to 2010, will there be a sequel?*

ACC: It does end in a pretty wide way, in fact the last chapter is called 20 001, but it certainly wouldn't be for many years, I just want a long, long rest now. It took me 14 years, after all, to build up steam for Odyssey Two.

V: *Are you pleased with the result?*

ACC: Yes, very happy with it. I can't imagine it being any different.

V: *You did say, of course, that 'The Fountains of Paradise' was going to be your last novel.*

ACC: I thought so too.

V: *I don't think we believed it . . .*

ACC: I believed it at the time, then I began to change my mind and now everyone asks what my next 'last' novel will be!

PUBLISHERS' NOTE

VOYAGER would like to thank Arthur C Clarke for taking time out of a very hectic schedule for this interview, also to Fred Clarke for providing the facilities in Somerset. Most of the linking text was taken from Arthur's personal report on his Hague-Moscow-Leningrad Trip, of which he gave us free use.

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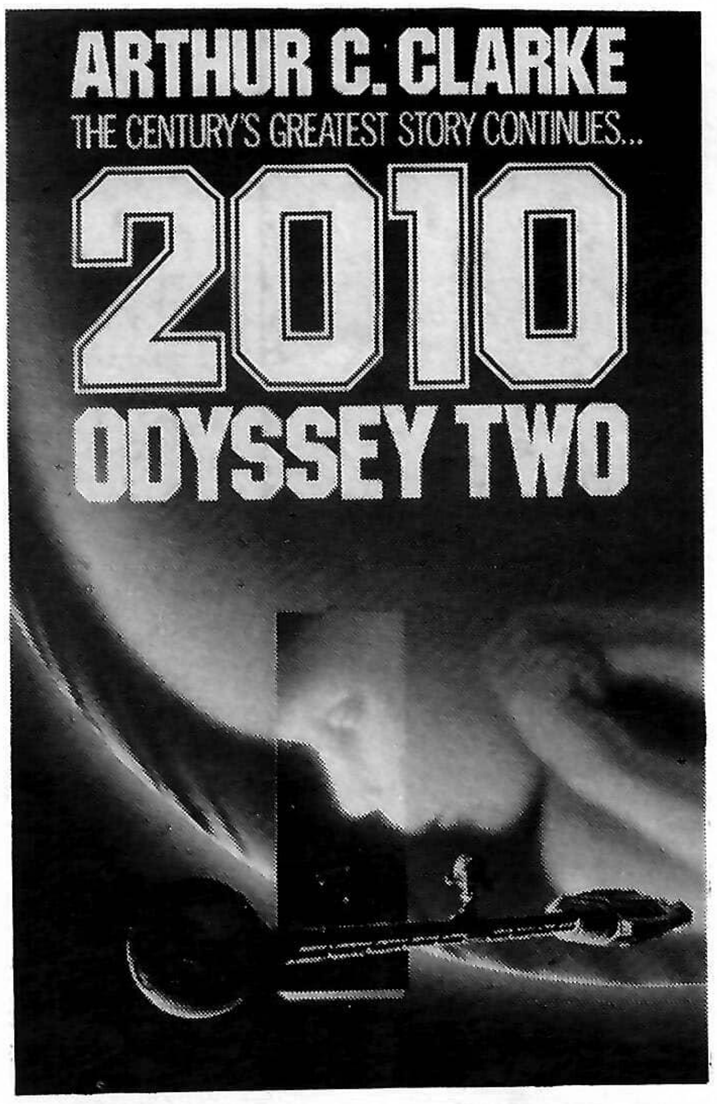

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THE VITAL SUN

PART TWO OF IAIN NICOLSON'S TREATISE ON OUR FASCINATING STAR

Evidence of other possible links between solar activity and Earth is beginning to emerge. Fluctuations in the interplanetary magnetic field and the solar wind have been linked to increases in the amount of storminess in the atmosphere and to the amount of thunderstorm activity. Studies in the United States have hinted at a possible link between the rainfall rate and the sunspot cycle but, in general, there is no clear evidence of any obvious link between climate and the 11-year cycle. Longer-term cycles may be more important, however. For example, sunspot records over the past 250 years or so seem to indicate a possible cycle of 70-90 years during which successive sunspot maxima become stronger and weaker, and that may tie in with climatic cycles over periods of that sort of length.

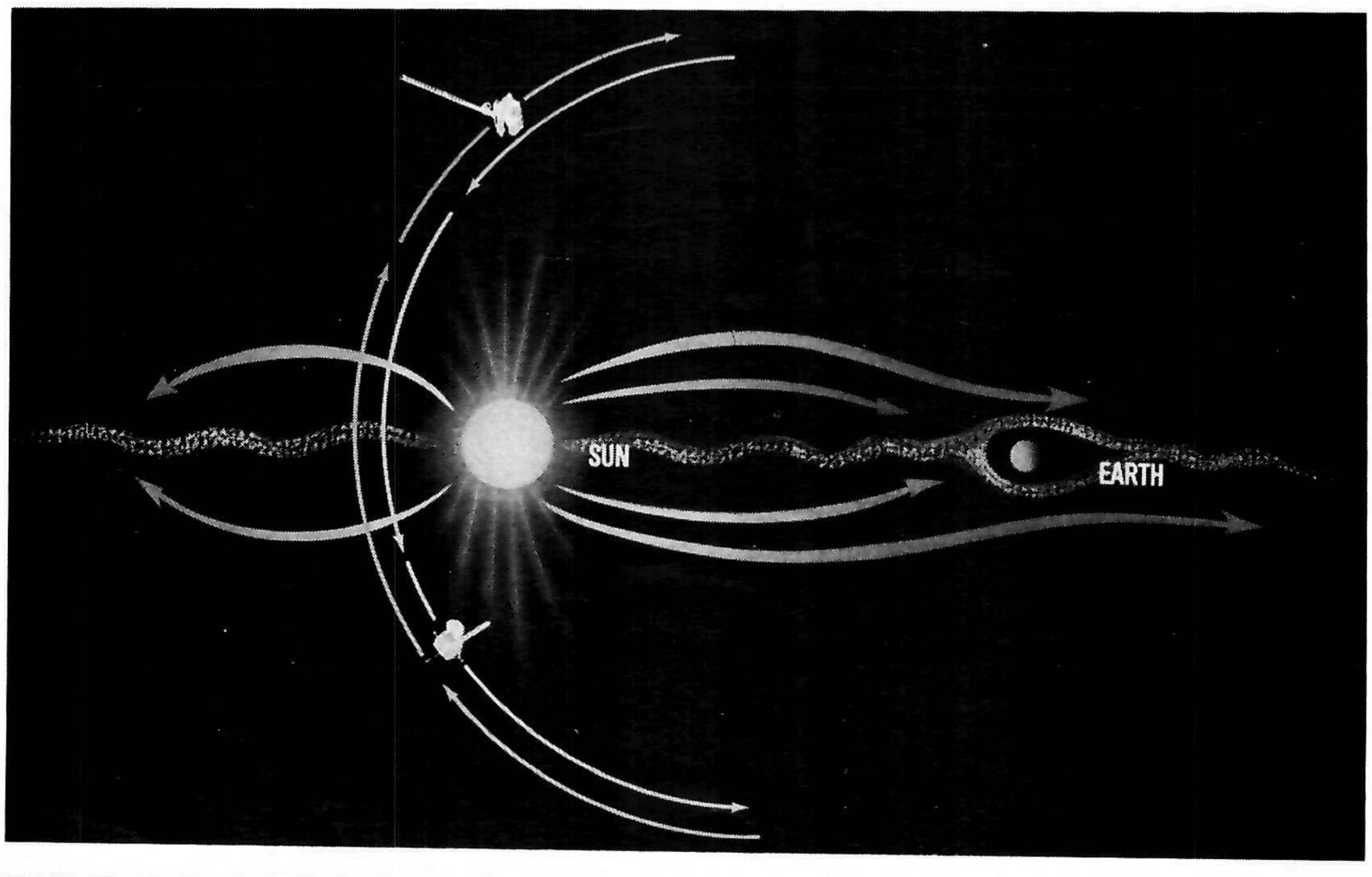
Very great interest has been stirred up over the past few years by the work of the American solar astronomer, John Eddy, who has delved deeply into historical records of sunspots and related activity and who believes there is clear evidence of a link between sunspot activity and climate. In particular, there is a period of about 70 years, from 1645 to 1715, during which sunspot activity seems almost to have ceased completely. This period of time – known as the Maunder Minimum after the first astronomer to draw attention to the lack of sunspots at that time – coincides with a period known as the 'mini-ice age', when winter conditions in Europe were more severe than usual, and the Thames froze over regularly. Eddy's work indicates that there were other times in the more distant past when long periods of low solar activity coincided with colder than average conditions and, on the other hand, periods of warmer than average conditions which appear to coincide with long periods of high solar activity. It must be admitted that the evidence is difficult to interpret, and Eddy's conclusions have been challenged, but the idea that there exists a link between solar activity and climate is a popular one today.

Because of the difficulty of allowing for the varying amount of solar energy absorbed in the atmosphere it was not possible, until recently, to measure accurately a quantity known as the *solar constant.* This is the amount of energy per second which would fall on an area of one square metre facing the Sun at the top of our atmosphere; it amounts to about 1·37 kilowatts per square metre, rather more energy than is given out by a one bar electric fire. Until recently, no-one knew whether or not this amount of energy really was perfectly constant. Over the past two years an instrument (the 'Active Cavity Radiometer') on the Solar Maximum Mission satellite has measured the 'solar constant' with much higher accuracy than was previously possible. The results clearly show that the amount of solar radiation reaching earth fluctuates from day to day by up to a few tenths of 1%; it drops below average when major sunspots are visible on the disc and increases above average when many *faculae* (bright patches in the photosphere, associated with sunspot groups but often seen before and after the appearance of the spots themselves) are on the disc.

Longer-term variations in the solar constant are suspected, but accurate observations have not been available for long enough to confirm or deny this possibility. One intriguing piece of evidence concerns changes in the observed brightnesses of the planets Uranus and Neptune and the satellites of Jupiter and Saturn which are consistent with an increase in the Sun's output during the 1970s of about 0·4%. As sunspot activity is now declining after the last maximum of 1979/80 it will be interesting to see if this decline is mirrored by changes in the solar constant.

Long term changes of a few tenths of 1% would result in important climatic changes, and a decline of just a few percent would probably be sufficient to plunge the whole Earth into an ice age from which it might never recover, since the increased snow and ice cover would reflect sunlight back into space and prevent the Earth's temperature from rising again even if the solar constant were to return to normal. Links between solar activity and climate deserve to be thoroughly investigated not only for their own interest, but because they could be vitally important to the future of life on earth.

How does the Sun produce its energy? At the very high temperature in the central core the process of *fusion* welds together atoms of the lightest element hydrogen to form the second-lightest element helium (in fact it is the nuclei of atoms which are involved). A small fraction of the matter involved in these reactions is turned into energy in accordance with Einstein's famous relationship which states that the energy released (E) when a



Artist's impression of the proposed Solar Polar mission, a venture to explore the 3D space around the Sun by flying two spacecraft out of the ecliptic and over the poles of the Sun itself. The mission is expected to impart new data on solar wind flow and cosmic rays. The former is indicated by the snake-like feature in the centre of the picture, and the arrows show material that comes from the Sun's polar regions and which affect Earth's environment in a manner not, as yet, clearly understood by scientists. Photo: NASA.

quantity of matter (M) is converted to energy is $E = Mc^2$ where c^2 denotes the square of the speed of light. In order to keep the Sun shining at its present rate over 4 000 000 tonnes of matter has to be converted to energy every second! The Sun is believed to be nearly five billion years old and is thought to have sufficient fuel to keep it shining at its present rate for rather more than a further five.

The precise process by which the Sun is believed to generate energy is called the *proton-proton reaction.* However, there are some puzzling reslts which cast doubt on just how well we understand conditions inside the Sun and the nuclear reactions going on there. The main worry is the so-called *solar neutrino problem.* Neutrinos are 'particles' which are usually assumed to have zero rest-mass (*ie*, if you could catch one and place it on a pair of scales, it would weigh nothing at all) and zero electrical charge. They can pass through solid objects as if they were transparent. Neutrinos produced in the solar core by the proton-proton reaction will mostly pass straight through the body of the Sun and, travelling at the speed of light, some of them will reach Earth about eight minutes later. If they could be detected, they would give us the latest information on what is going on deep inside the Sun.

Obviously, neutrinos are very hard to capture – but it can be done. Since 1964, the most extraordinary astronomical experiment, devised by Professor Ray Davis of the Brookhaven National Laboratory, has been going on 1 500 metres underground down an old gold mine in South Dakota, USA. The solar neutrino 'telescope' consists of a tank containing about 400 000 litres of perchlorethylene (C_2CL_4), a form of dry-cleaning fluid which contains a great deal of chlorine, part of which is in the form of the heavy isotope, chlorine-37. If an atom of Chlorine-37 captures a neutrino, it turns into radioactive argon. By measuring the amount of argon produced, the number of neutrinos arriving from the Sun can be calculated. The experiment has to take place underground to shield the tank from other kinds of radiation which would confuse results.

If the standard theory of the Sun is correct, this vast tank of dry-cleaning fluid should capture about one neutrino per day. In fact, on average only one third of that number is captured. This suggests that something is wrong somewhere; with the experiment (but that has been thoroughly checked), with the nuclear physics, with our ideas about the interior of the Sun, or perhaps, with our ideas about the nature of neutrinos. No-one knows for sure which, if any, of these options is the correct one. The low numbers of neutrinos could be accounted for if the core of the Sun were about 10% cooler than we think, but if that is so, many of our other beliefs about the Sun and its structure will have to be abandoned. Another suggestion is that the output of energy from the core fluctuates over long periods of time. The light coming from the photosphere represents energy produced hundreds of thousands of years ago (light takes that long to work its way to the surface) but neutrinos reach Earth just a few minutes after being produced. Some astronomers have argued that the small numbers of neutrinos indicate that the Sun's core is at a low ebb in its energy production cycle. At present there is no good reason to suppose this to be the case, but the idea has been linked with the hotly-disputed suggestion that the Sun is at present shrinking (as would be expected if the rate of energy production were reduced) as part of a very long-term cycle of expansion and contraction.

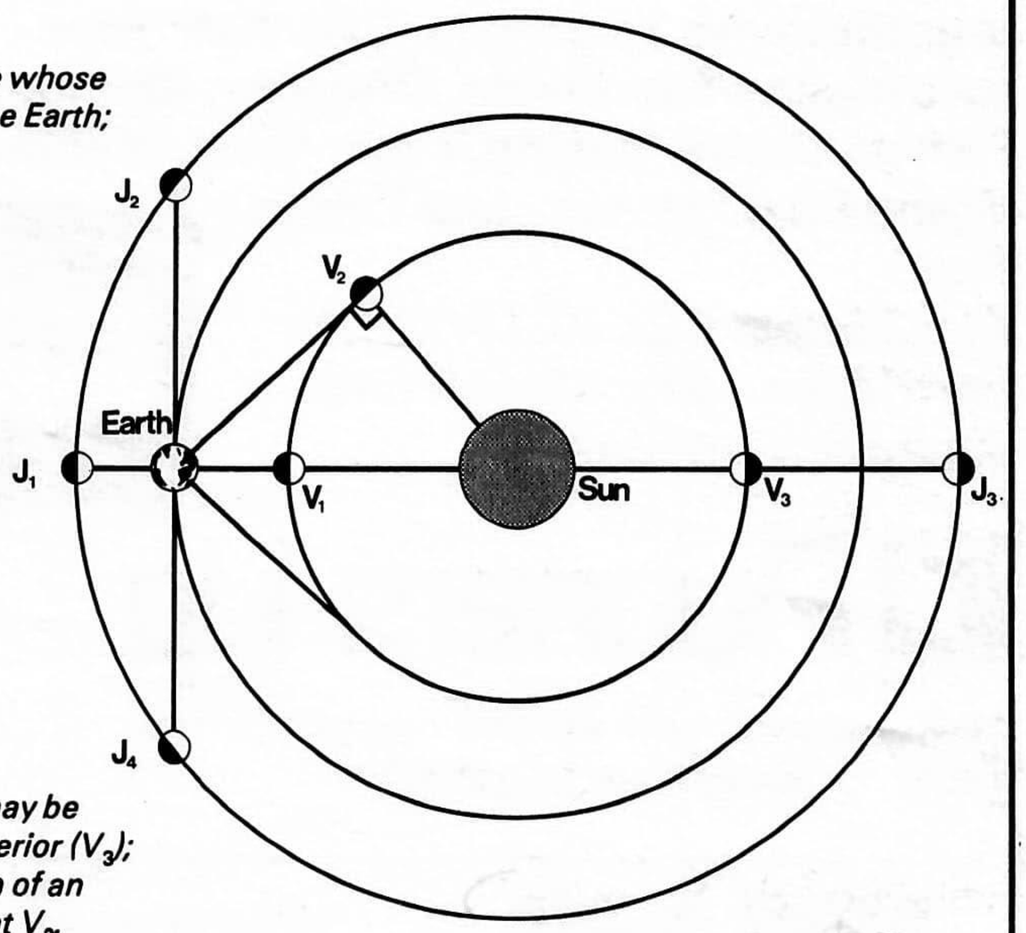
Yet another hypothesis concerns the neutrinos themselves. There is good evidence to suggest that there are three different 'families' of neutrinos, and it has been argued that if, instead of having zero mass, neutrinos have a very tiny, but finite, mass, neutrinos could swap to and fro between the various types. That being so, it is possible that by the time solar neutrinos reach Earth they are roughly equally divided between the three families. As the dry cleaning fluid can detect only one type of neutrino (the 'electron family') it would, as observed, detect only one third of the expected number of neutrinos. This rather neat 'explanation' has been treated by most astronomers and physicists with the utmost suspicion and, of course, there is no clear evidence to show that neutrinos have masses at all.

The solar neutrino problem remains a fascinating puzzle and serves to remind us that we should not be over-confident about our theories of how the Sun and stars shine. This problem, together with the puzzles associated with the sunspot cycle, solar flares, variations in the output of solar energy, and possible oscillations of the Sun itself, will keep astronomers, physicists and climatologists busy and fascinated for a long time to come. We are a long way indeed from a complete understanding of this, our nearest star. *

PUBLISHERS' NOTE
NEVER look at the Sun through a telescope or binoculars. Serious and irreparable eye damage, and quite probably permanent blindness, would be caused by the concentrated heat and light. It is dangerous to stare at the Sun even without a telescope. BE WARNED!

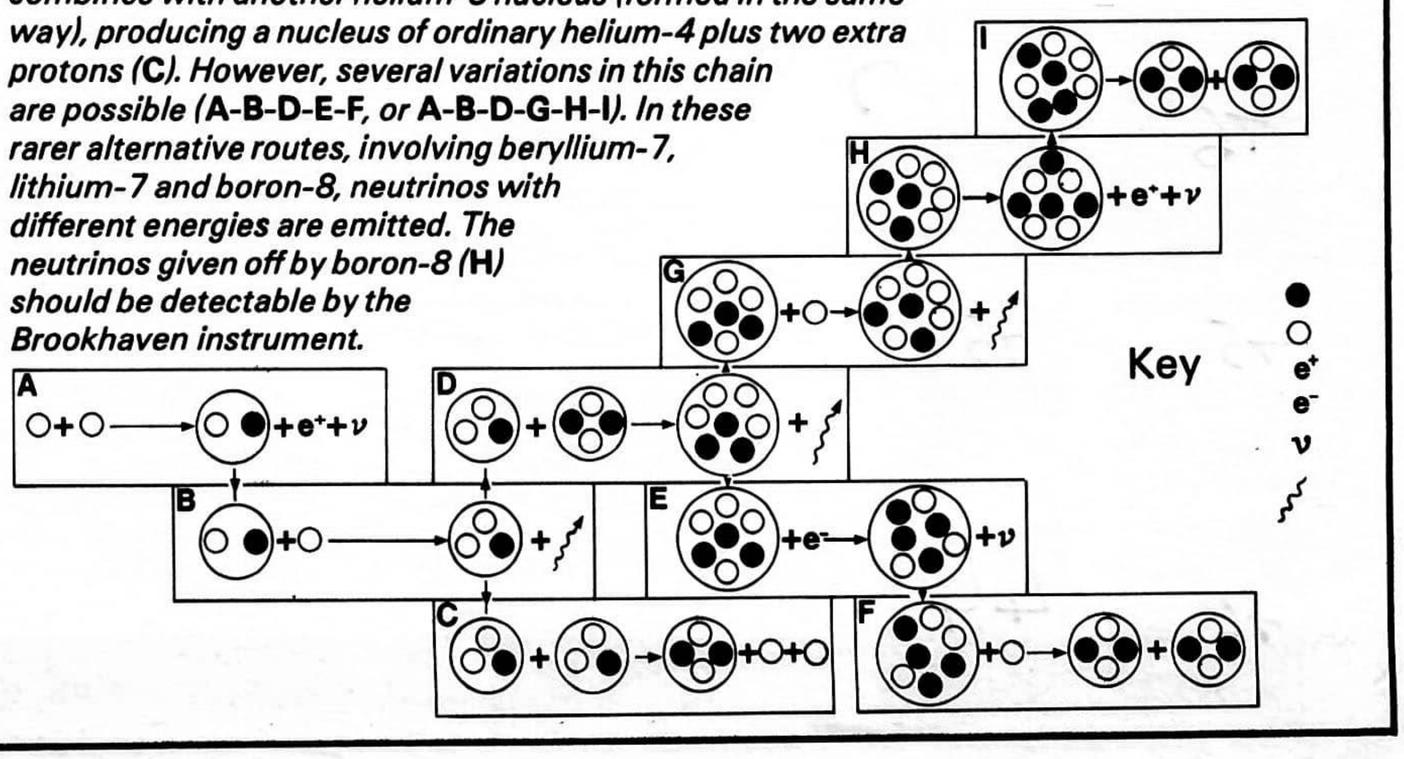
PLANETARY CONFIGURATIONS

An 'inferior' planet is one whose orbit lies inside that of the Earth; the others are said to be 'superior'. A superior planet is in 'opposition' (J_1) when it lies directly opposite the Sun in the sky; it is in 'quadrature' when the angle measured at the Earth between it and the Sun (called the 'elongation') is 90 (J_2 and J_4). When either a superior or an inferior planet is directly in line with the Sun (V_1, V_3 and J_3) it is said to be in 'conjunction'. In the case of an inferior planet the conjunction may be either inferior (V_1) or superior (V_3); the maximum elongation of an inferior planet is shown at V_2.



PROTON-PROTON CHAIN

The main source of the Sun's energy is believed to be a chain of nuclear reactions in which hydrogen nuclei (protons) are converted to give helium (an atom containing two neutrons and two protons). The simplest route involves only three steps (A-B-C). Two protons combine to give a deuterium nucleus (a proton and a neutron), which emits a positron and a neutrino (A); the deuterium then combines with a proton, yielding a nucleus of helium-3, which emits a photon (B); finally the helium-3 combines with another helium-3 nucleus (formed in the same way), producing a nucleus of ordinary helium-4 plus two extra protons (C). However, several variations in this chain are possible (A-B-D-E-F, or A-B-D-G-H-I). In these rarer alternative routes, involving beryllium-7, lithium-7 and boron-8, neutrinos with different energies are emitted. The neutrinos given off by boron-8 (H) should be detectable by the Brookhaven instrument.



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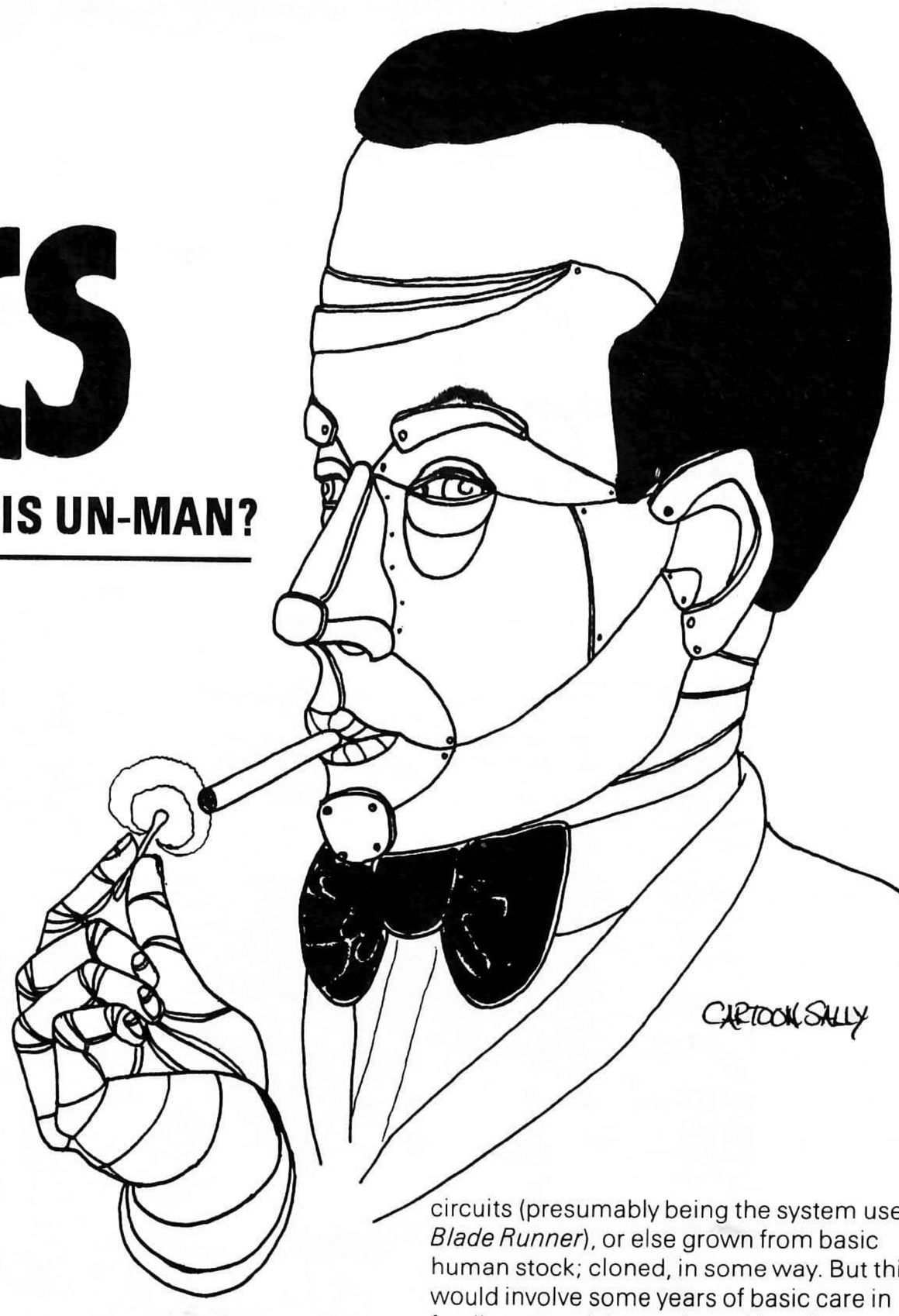
ROBOTICS

THE PROPER STUDY OF MANKIND IS UN-MAN?

BY RICHARD AND MARION VAN DER VOORT



The film *Blade Runner,* based on the late Philip K Dick's book, *Do Androids Dream of Electric Sheep?* is centred on androids, that is, imitation men. They always seem to be stronger and quicker than men, and more intelligent; they start with no emotions and acquire them as they go along at which stage they become dangerous. There are various devices to circumvent this: the 'restraining bolt' in *Star Wars;* Asimov's Three Laws of Robotics; in *Blade Runner,* the short life span of four years. Even *Alien* had an android, more dangerous than the alien itself, because to it the crew were expendable. Just how likely are these bogey-men? To our un-scientific eyes, quite impossible.

First of all, why the human shape? We've been told that it is the most efficient one – well, let's wait until we meet some other intelligent alien . . . The pattern may be fine, but anyone who has ever suffered from a slipped disc, ingrowing toenail or appendicitis will testify that there could be certain improvements on the basic design!

Also, as an ultra un-specialised specialist, would it help robots? What robots we have already are very specialised, they paint cars, cut steel, play chess, operate cameras, with appropriate limbs, eyes and printed circuits. In times to come they will undoubtedly have wheels, caterpillar tracks, photosensors in their bottoms, etc., but what advantage would it be to them to totter along on two legs with eyes only in the top of their head? What would they have in their torso, anyway? Presumably printed circuits, and a small atomic battery. Stomach, liver, kidneys and intestines would hardly be necessary.

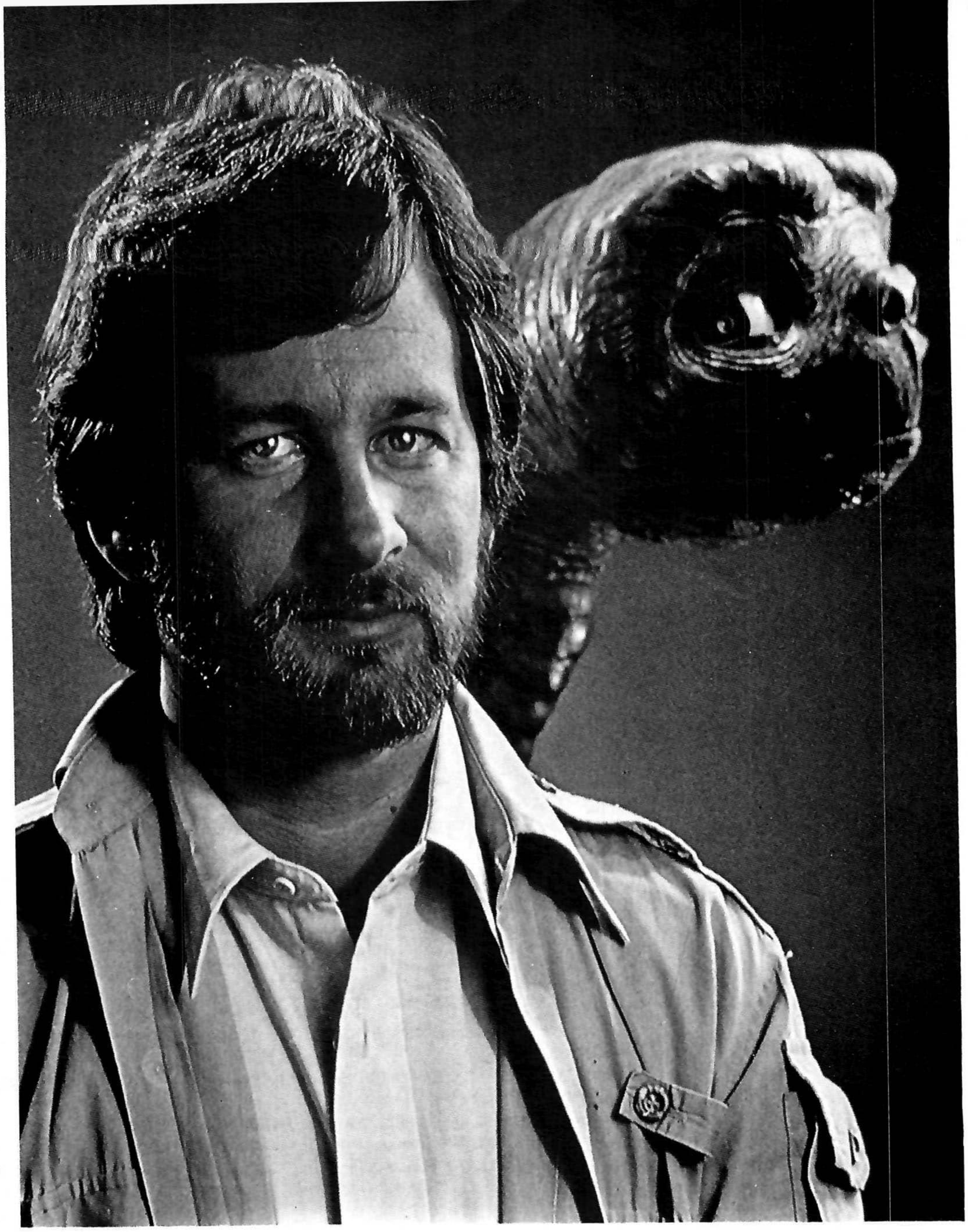
Now, we'll look closer at mechanical men. It might be possible to combine a mechanical body with printed circuits, presumably an electro-mechanical brain, make them small enough to be human-sized, and also be assembled by other robots. This would save time and money, but would anyone bother to give them a human-looking skin, eyelashes and fingernails?

Organic robots could be made either by a kind of rubber mould process, fitting in printed circuits (presumably being the system used in *Blade Runner*), or else grown from basic human stock; cloned, in some way. But this would involve some years of basic care in feeding, exercising and teaching. Even with genetic engineering it would cost a lot, more than could be repaid in 40 years, rather than four. They would need constant upkeep, too, in food, clothes, medicine, etc. What kind of world would they fit in? Either humanity would be very rich, and live in complete leisure, or else it would be very sparse, with robots employed to keep civilisation going. I doubt if a society based on the present day would even find room for them.

As for their brains, and their emotions, who can say? We don't know enough of our own brain yet to be designing others. Would we give them a reflex system based on the primitive brain, like ours? How much intelligence would they need to be intelligent? If we managed to give them as much capacity as we have, would they actually start thinking for themselves? And would they have feelings, or *learn* to have feelings? Stronger than humans, yes. Quicker, maybe. Though certainly most film directors base robots on the Robbie from *Forbidden Planet* – ungainly and hardly quick off the mark. No, we don't think that androids will be around for some time, if at all.

On second thoughts maybe there is a way, not only in theory, but it has been tried even in this century. Take human beings, breeding them if necessary for certain characteristics; bring them up in an atmosphere of constant propaganda, maybe treat them surgically or by drugs to an unthinking obedience. Hitler managed it in a few short years with the SS, the Hitler Youth, even the bureaucrats obeyed orders, murdering thousands. How many generations would it take to produce a population of physically fit, mentally numb, organic robots? *

Pris (Daryl Hannah) and Roy Batty (Rutger Hauer), the talented and powerful replicants from Blade Runner. Are these androids suitable prototypes for the future? Our authors think not . . .
Photo: Copyright © 1982 The Ladd Company.



E.T.

STEVEN SPIELBERG'S LATEST FILM HAS ALREADY TAKEN AMERICA BY STORM AND LOOKS ALL SET TO REPEAT ITS SUCCESS IN THE UK. A SUITABLY IMPRESSED RAY RIMELL REPORTS.

Under the star-studded sky a brilliantly illuminated spaceship has landed in a forest clearing, the hatch has opened, gangplank lowered, and small goblin-like creatures are abroad. Cowled figures wreathed in mist, beings from another world, probing the soft damp earth with strange looking implements. They toil quietly and cautiously, fearful of possible discovery as they gather samples of terran flora from around their globular ship. One member of the group is distracted by far-off lights glimpsed through the towering trunks of the Redwood forest and, pausing only to uproot a sapling, waddles off to investigate. Pushing his way through the moisture-laden undergrowth, the little creature suddenly finds himself on the edge of a highway above a sprawling mass of twinkling lights. Stepping out onto the road the alien gazes in awe at the sleeping town spread out before him. It all seems so tranquil . . .

Then the silence is rudely shattered. Large mechanical vehicles are screaming towards him, bright headlights blinding the terrified starman as he desperately dives for cover beneath a nearby thicket. The cars screech to a halt; one stops just beyond him, its tyres crushing the treasured sapling dropped in mid-flight. Men pour out of the vehicles, bearing torches they run off into the forest, the harsh sound of their voices echoing strangely in the night air. The creature's fellow travellers are immediately aware of the sudden invasion, sending warning signals to their separated companion who frantically rushes back through the trees. But safety of the ship and its flight crew is paramount, they wait as long as they dare. The hunters are almost upon them. They have no other choice.

Bursting out into the clearing, the alien visitor is just in time to see his companions blast off, their spacecraft hanging momentarily over the trees like some enormous Hallowe'en Jack O'Lantern before accelerating away up into the heavens. Extending a long spindly arm toward its rapidly disappearing glow, the creature lets out a plaintive cry of confusion and panic. He is afraid. He is totally alone. He is three million light years from home . . .

Above, Steven Spielberg and friend – a winning combination if ever there was one. Right, Elliott and his extra-terrestrial passenger soar above the Redwood trees to the forest clearing where they will attempt to contact E.T.'s spaceship. Photos: Copyright © 1982 United International Pictures (UK).

'He' is E.T. and he has rewritten cinema history. The sheer magic of director Steven Spielberg's latest masterpiece, now on general UK release, has already caught the imagination of millions of Americans who, within a month of the film opening to 1323 theatres on June 11 last year, paid out a staggering $86.9 million in box office receipts. Spielberg rarely sells his audiences short and *E.T.* could hardly have a more impressive pedigree than *Jaws, Close Encounters of the Third Kind* and *Raiders of the Lost Ark,* films which are firmly established as among the most financially rewarding ever.

When suburban hero Roy Neary (Richard Dreyfuss) entered the alien mothership during the closing scenes of *CE3K,* how many of us would not have willingly changed places with him? Yet Spielberg did not extend an invitation for us to join him on the cosmic excursion; even the 'Special Edition', for all its pacy re-editing, additional scenes and a glimpse inside the mothership, left audiences wanting still more. Now Spielberg has provided more – and with considerable vengeance – not so much a *CE3K* sequel but yet another example of the director's skill in successfully mixing the ordinary with the extraordinary. And *E.T.* is, by any yardstick, a quite extraordinary film.

Following the success of *CE3K,* millions waited in vain for the *'CE4K'* which never materialised. Instead there came the surrealistic wartime comedy *1941,* a comparative flop by Spielberg standards, followed by a highly successful collaboration with George Lucas on the exhilarating *Raiders of the Lost Ark.* All the while there were strong rumours concerning a new Spielberg SF space epic. Several ambiguous working titles were frequently quoted in the Hollywood gossip columns; *Night Skies, A Boy's Life* (the latter from Spielberg himself in order to keep the project's contents a secret), *E.T. and Me* and, finally, just plain *E.T.,* subtitled 'The Extra-Terrestrial – in his adventure on Earth.'

Initial announcements of Spielberg's two Summer films, the other was *Poltergeist,* were received with lukewarm enthusiasm in the States. Both were small budget productions (small by current Hollywood standards at any rate), both lacked well-known stars and yet within just a few weeks of their release, both were riding high in the ratings. Subsequently, and in an incredibly short time of six months, *E.T.* has proved to be the most financially successful film yet made, surpassing even the five year record held by *Star Wars.*

During the months leading up to the December 9 London premiere, there has been a great deal of media coverage, many published photographs (in advance of official press releases) have been regarded as illegal by *E.T.* distributors **UIP (UK),** and thousands of pirate videos, despite their reported inferior quality, have threatened potential box office returns. Yet, stripped of all the 'hype', *E.T.* still stands apart – a true cinema classic if ever there was one. Unusually, for a 'science fiction' picture, press reviews have been generally enthusiastic, if not ecstatic, which serves to indicate how firmly Spielberg's loveable little space elf has cast his spell on even the most worldly-wise of critics. For *E.T.* is that type of a film. I can honestly say that it is simply the most moving and enjoyable motion picture, of any kind, that I have ever seen. Further personal comments would be superfluous; it's enough to say that Steven Spielberg has produced a warm and affectionate production which is destined to become firmly lodged in this decade's folklore.

I find it impossible, indeed irrelevant, to actually attempt an objective review of such a charming film as *E.T.,* nor do I intend to assail readers with a lengthy discourse on the psychological effects it is supposed to have had on its younger audience. Some American critics have suggested that *E.T.* hints at 'subversion' and carries an anti-social message, arguing that it pits children against adults with the latter emerging as the villains. I dismiss such nonsense without qualm along with any assertions that *E.T.* is a negative, even a harmful, film for youngsters to see. I'm sure *VOYAGER* readers will have no interest in such observations and will be primarily concerned with behind-the-scenes production aspects of *E.T.* and its director's own views on the project.

On Location

Spielberg shot *E.T.* almost exclusively in and around Los Angeles, beginning principal pho-

Elliott (Henry Thomas) and E.T. wait patiently in the Redwood forest clearing for any signs that they have made contact with the extra-terrestrial spaceship. In a recent interview with Rolling Stones' Michael Sragow, director Steven Spielberg admitted: 'The thing that I'm just scared to death of is that some day I'm gonna wake up and bore somebody with a film. That's what's kept me making movies that have tried to outspectacle each other'. Most people will agree that if Spielberg continues to give us pictures like Jaws, Raiders' and E.T., such fears will go unrealised . . .

tography on September 8, 1981. The first 48 hours were spent on interior scenes at a Culver City high school where, it is strongly rumoured, a scene involving Harrison Ford as Elliott's science teacher ended up on the cutting room floor. In the final edit the part was played by Richard Swingler – lovers of trivia take note. Production then shifted between the communities of Northridge and Tujunga for 11 days of exterior shooting. Over 40 days were subsequently spent on three sound stages at the Laird International Studios in Culver City, while a final week of exterior shots was completed near Crescent City, a small Californian coastal town close to the Oregan border.

Originally scheduled for 65 days principal photography, *E.T.* was completed four days ahead of timetable. Then came the exacting task of completing difficult and complex post-production scenes including the many and varied special effects sequences. Spielberg broke with tradition in his direction by forsaking the use of storyboards. He subsequently explained this radical approach:

'I really can't remember a time, except maybe when I was making little films in 16mm, back in college, when I didn't draw everything out. I sketched about 40% of this movie on paper and decided that I was being pencilled into a corner. Using the script is the best storyboard I had and everything else from that would be the ideas I would get from blocking a scene, looking at a set.

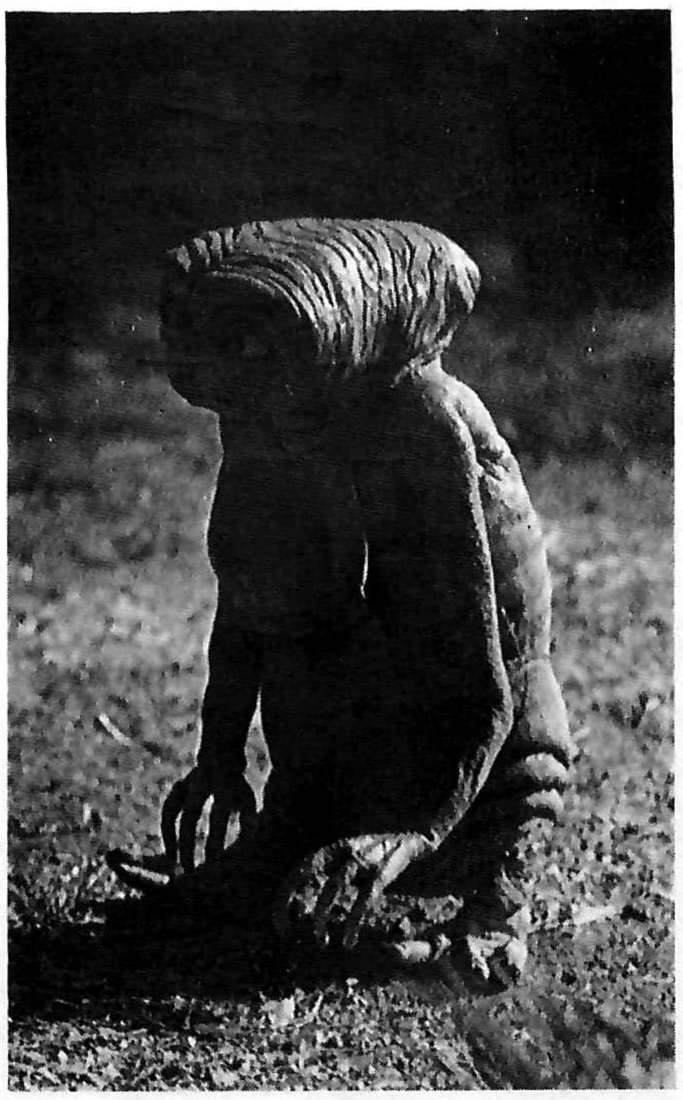
'I wasn't thinking five shots ahead,' he adds. 'I always think five shots ahead. On this picture, I couldn't be. I was thinking to, perhaps, only the next shot, but it's been better for this movie which has so much emotion in it.'

E.T. production designer was Jim Bissell, for whom the project became his initiation into the demanding world of feature films. Bissell joined the team some six months after such notables as artist/designer Ralph McQuarrie and illustrator EA Verreaux had been hired by Spielberg. Bissell's main responsibility was concerned with finding suitable locations and designing the sets; both exterior and interior aspects of the real-life house (where Elliott lives) on site. Bissell eventually found what he was looking for in the small town of Sunland. The chosen house was ideal:

'It has a fantasy aspect about it. It's stucco with tile roofs everywhere. It has these beautiful mountains in the background and (it was) so isolated. It was like a tract house but removed and glorified somehow . . .'

Bissell designed sets for three different stages, one of them fitted out with upstairs bedrooms for Elliott, Gertie and their mother, as well as a bathroom. It was in the latter that Spielberg shot scenes of E.T. in the bathtub, scenes that he was later to edit out of the final print, much to his eventual regret. (Maybe it will be reinstated in *E.T. – The Special Edition*?)* A second stage was dominated by a full-size first floor duplicating exactly part of the house in Sunland complete with back yard, shed and adjacent hillside. The last site became the Redwood clearing where E.T.'s spaceship lands and blasts off. It will come as no great surprise to most that the outfit responsible for the special visual effects, including the beautifully appointed 'UFO', was **Industrial Light and Magic** of Marin County,

*Publishers' note. This is a joke.



Following a trail of chocolate sweets, a nervous E.T. emerges from his backyard hiding place and follows Elliott into his mother's house. A strong bond rapidly forms between the two main characters and their scenes together provide much of the magic of Spielberg's superior film. All photos: Copyright © 1982 United International Pictures (UK).

EVOLVING E.T.

Carlo Rambaldi and some early pre-production sketches of E.T. – first stages in creating a creature.

There was, after all, only one man who could have transformed Steven Spielberg's vision into a complex mechanical masterpiece, so stunningly realistic that most cinemagoers are prepared to concede ET really is a living creature. Yet how does one begin to create a 10 million year old botanist from an ancient star system *and* make him credible enough to enrapture his audience so totally? After initial attempts by one special effects team failed (to the tune, it is said, of a mere $700 000) Spielberg turned to Italian painter/sculptor Carlo Rambaldi. The director of *E.T.* had some pretty firm ideas on how his extra-terrestrial character should look.

I wanted a creature that only a mother could love. I didn't want him to be sublime or beautific, or there would be no place to go in the relationship.'

So Rambaldi, already highly acclaimed for his work on *King Kong, CE3K* and *Alien,* set to work on preliminary sketches and small clay models for Spielberg's approval prior to constructing the full-size working model. Once the design had been finalised, Rambaldi constructed a steel and aluminium 'skeleton' over which layers and layers of polyurethane, fibreglass and foam rubber were applied. Specially adapted mechanical controls and electric servos assisted in producing body animation and facial movements; with up to 11 operators, E.T. can produce 150 separate movements. He can smile, wrinkle his pug-like nose, widen his eyes, furrow his brow, raise or lower his head on his telescopic neck, extend his arms, crook a prehensile fingertip which lights up when required, and has a heart light that glows red in his chest.

Obviously, such complex mechanics were impossible to fit into just one effects model, so Rambaldi eventually constructed three. One E.T. had electric controls for smaller movements, another, operated by remote levers, was used for extensive body movements and the third featured a combination of those controls used in the other two. Actually, there was yet a further E.T., a 'suit', especially adapted for midgets to wear whenever the little space creature had to stagger drunkenly across a room or lurch up the ramp of his spaceship. E.T. also enjoys a vocabulary (limited to ten words) said to be handled by a former speech teacher, her voice electronically distorted. On screen, the final effect is quite astonishing.

Unlike the ethereal alien visitor of *CE3K,* whose appearance was of the briefest kind, E.T. is way up front in almost every scene of his picture, performing as well as any human actor and usually more reliably too. The director again:

'In terms of physical production, E.T. is probably the most successful special effect I've ever worked with, including *Jaws* and *Close Encounters.*

'It worked during the testing and it worked every day during production and I always felt he was able to perform just about every emotion I needed, based on the screenplay.'

To produce such sophisticated SFX as E.T., **Universal Pictures** had to shell out a cool $1.5 million. Yet E.T. comes relatively cheap – certainly cheaper than Marlon Brando, Spielberg was quick to point out – and has repaid his production costs several times over.

E.T. is probably the first film in which the title star, credible as the leading character throughout, is neither actor nor animal, but a creation of a film director's imagination and the skills of inventive craftsmen. That *E.T.* is so successful reflects the extraordinary talents of men like Spielberg, Rambaldi and their colleagues – men who can make you believe in the unbelievable . . . •

fresh from their success on *Star Trek II, The Wrath of Khan.*

Spielberg chose the talented Allen Daviau as his Director of Photography who, at the outset, was determined to create a definite air of reality to every scene. Both Daviau and Spielberg decided that any illumination had to be justified by a logical source, *viz,* a lamp, a window, or natural daylight. Daviau recalls:

'In the house in particular, it had to have this sense of very realistic light sources. You only get into fantasy when you're dealing with the rocket ship, when you're dealing with things that are otherwise from the extra-terrestrial. But when you're in the house, you have to believe the house, the neighbourhood, everything, as being realistically photographed.'

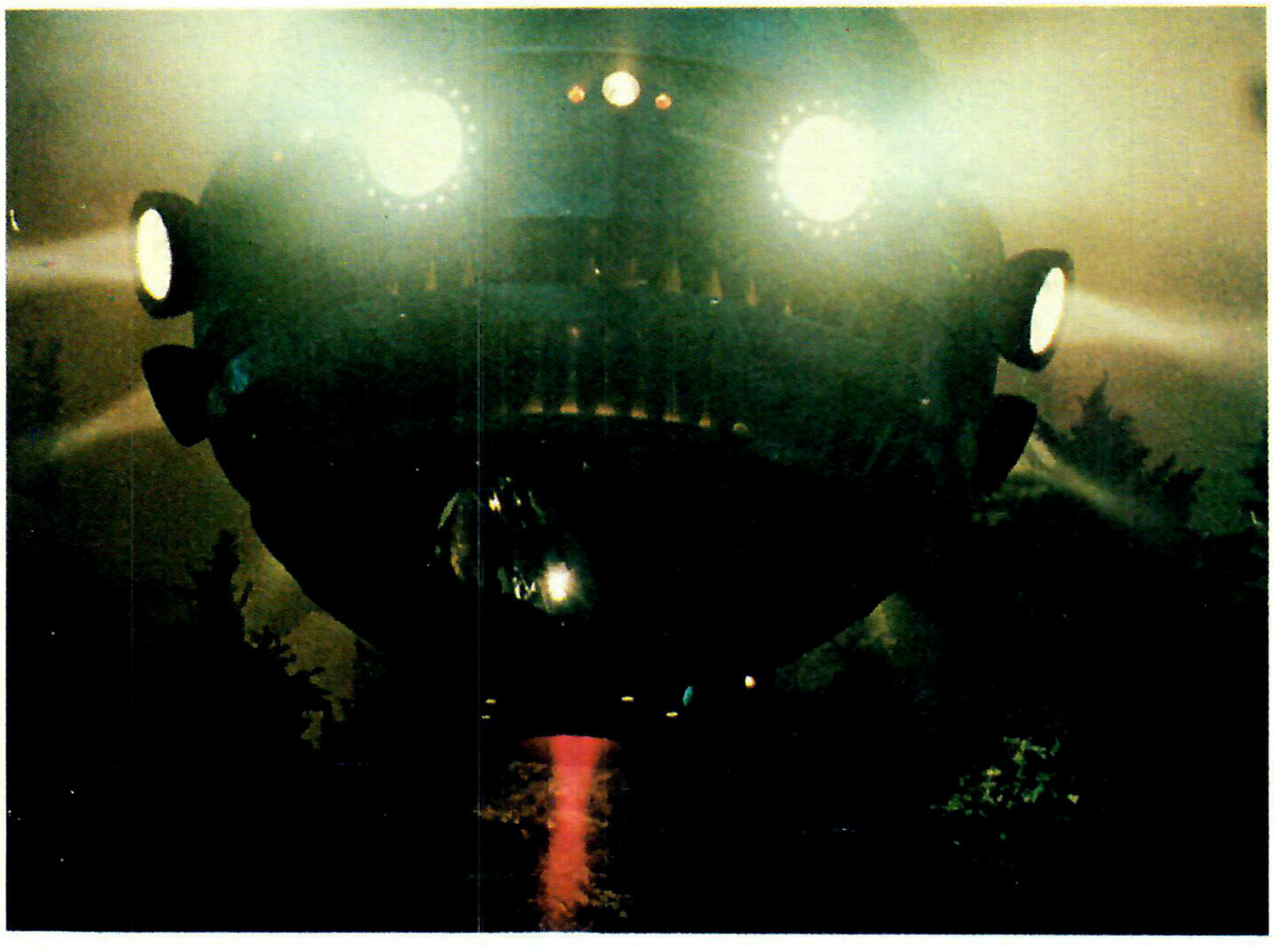
As a result of their labours the desired effect has been achieved. Overall, *E.T.* is a stunning and delightful visual treat and there are so many outstanding scenes, it's difficult to resist the temptation of outlining them all here. However, since that would spoil the enjoyment of those readers yet to see for themselves, I'll refrain from revealing further details for the moment. Just in passing, though, watch out for several clever 'in-jokes' and references to a number of famous films – past and present – throughout the picture. There's also the obligatory chase sequence that has characterised nearly every American TV or movie action drama since *Bullitt.* Yet Spielberg has managed to outdo even himself. After *Duel,* pursuit sequences during the final scenes of *E.T.* are the most original and exciting you're likely to see for some time to come.

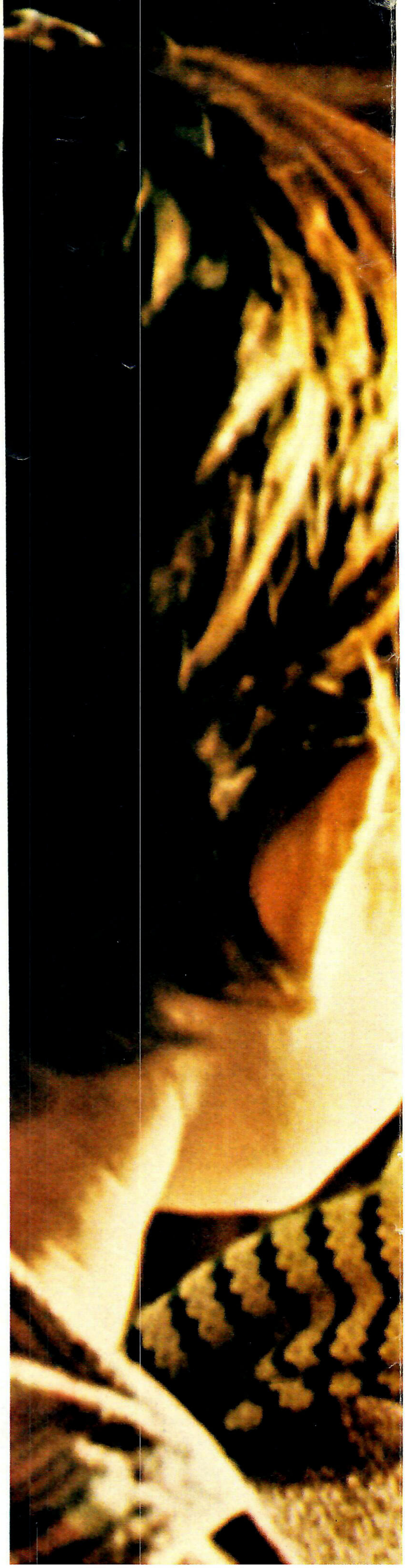
As well as having some superbly funny moments, *E.T.* will also do wonders for the sale of paper handkerchiefs if UK press showings were anything to go by. On the way out of the first London screening, everyone sympathised with an embarrassed mother who was trying to comfort her screaming infant daughter. This little girl refused to budge. Pointing to a blank screen where only moments before, E.T. had faded from view, she resisted all attempts to console her. For all we know, she's probably still there . . . Make no mistake about it, *E.T.* not only means Extra-Terrestrial it also stands for EnterTainment and, in my opinion, justly deserves all the accolades currently being heaped upon it.

Thus far, though nominated, Spielberg has yet to achieve the supreme award for his contribution to modern cinema. While it is foolhardy to predict anything in the fickle movie world, he must be a strong contender for an Oscar this year as a result of *E.T.*'s runaway success. For many, *E.T.* may not be the best film ever made, it might not really be said to be science fiction, but of all those who have queued long to see it, few will argue that it did not move them. And a sequel? Spielberg has already dropped broad hints at such a tantalising prospect; meanwhile he is currently at work on a more immediate follow-up, with George Lucas on *'Raiders of the Forbidden City.'* As far as *VOYAGER* readers are concerned there *will* be an *E.T.* 'sequel' and you'll only have to wait three months for it. In our next issue there'll be other stories and other pictures along with the latest news concerning the flood of *E.T.* – spawned merchandising. Meantime, forsake those bootleg videos and make the effort to catch *E.T.* at your local cinema. I doubt you'll be disappointed.

Acknowledgements
The editors of *VOYAGER* thank Geri Winsor of **United International Pictures (UK)** for assistance in providing production notes and stills for this feature.

Below: 'The Jewel of the Galaxy', the incredible UFO built by Industrial Light and Magic of Marin County is one of the many SFX highlights of E.T. – The Extra-Terrestrial. At right, Elliott and E.T., the two central characters of Steven Spielberg's entrancing new film which has broken all box office records in the USA. Now it's our turn and already the stores are full of E.T. merchandising in the wake of the film's UK premiere in early December. **Photos: Copyright © United International Pictures (UK).**





HERE COMES THE JUDGE

IAN LIVINGSTONE, INVENTOR OF THE NEW DREDD BOARDGAME, CHARTS THE RISE TO FAME OF THE CULT FIGURE FROM THE COMIC *2000AD*

The place is Mega-City One, a vast post-holocaust metropolis of the 22nd Century on the eastern seaboard of the USA, where more than 800 million citizens live on a knife-edge of tension. Crime is a way of life for many, but one thing is certain – Judge Dredd is the law and he will stamp out any lawbreaking without mercy, whether the crime is littering or murder. He insists it's for the criminals' own good.

Never heard of Judge Dredd? For many, he's the best thing that's happened to British comics since Dan Dare. Dredd first appeared in issue 2 of *2000 AD* in March, 1977. Published by the British press giant **IPC**, the revolutionary science fiction comic was launched onto a market previously dominated by **Marvel** and **DC**. *2000 AD* soon became popular, appealing to people of all ages, and its success can be attributed mainly to Judge Dredd.

He was the brainchild of Pat Mills, the driving force behind the launch of *2000 AD*, and developed in co-operation with John Wagner who had been working on an idea about the police of the future, being judge, jury and executioner all rolled into one. The Spanish artist Carlos Ezquerra created the first visualisation of Judge Dredd and drew the first episode. He is also drawing the current episodes of Dredd, coincidentally enough. In between times, Dredd became a strong character artistically due to the individual talents of Brian Bolland, Mike McMahon and Ron Smith.

Dredd's role is to determinedly execute the law in a crazy city of the future. He is a loner resembling a cross between 'Dirty' Harry Callahan and Mad Max. Mega-City One is a complex network of massive buildings and seething population, similar to the vision of future Los Angeles in *Blade Runner,* but with more accent on the mutated, alien or mad inhabitants. Superficially, Dredd is a typical youngster's comic character, but underneath can be found satire and social comment on the state of the world in the 1980s which appeals to older readers and which has contributed much of Dredd's cult status.

The immediate appeal to Dredd is the strong storyline, its violence, humour and superb artwork. The strong storyline revolves around the bizarre inhabitants of Mega-City One. Most of the perps (Justice Department slang for criminals – perpetrators of crime) have some odd feature, or trait, about them. Judge Death, for example, comes from another dimensional world where life is illegal and he tried to destroy all life in Mega-City One because, 'crime breeds only in the living'. The Angel Gang are a violent family from the Cursed Earth (the radioactive hell in America's heartland) who derive pleasure from killing.

All Judge Dredd artwork used with permission and copyright © of IPC Magazines, Ltd.

Link is big and dumb with a natural urge to kill; Junior is a natural born psychopath and Mean Machine is a cyborg with a technomek arm and dial in his steel-plated skull that adjusts his mood – 1 is surly, 2 is mean, 3 is vicious and 4 is brutal. They were led through their reign of terror by Pa Angel, their beloved father. The Kleggs are blood-thirsty alien mercenaries who enjoy killing and prefer to be paid in meat. The mad, tyrannical Judge Cal (a parody on the Roman emperor Caligula) brought them to Earth to prolong his reign as Chief Judge. Most were killed fleeing the planet at Cal's overthrow, but a few remained in hiding. They are well-remembered for their brutality and still feature in the Alien Relations Board's famous advertisement – *Not all aliens are Kleggs! Be nice to your neighbourhood alien and he'll be nice to you . . .*

The buildings of Mega-City One are unlike any that we know today. The New You Face Parlour offers citizens the opportunity to have instant face changes using genetic surgery and synthi-flesh techniques. The Palais de Boing is the only legal place where boinging is allowed. Boing, the wonder toy of the 22nd century, can turn people into human pinballs with one quick spray from an aerosol canister. A boinger enveloped by a clear plastic bubble can bounce safely from buildings and roof tops to the streets below. However, outdoor boinging was banned due to the chaos it brought and was restricted to the Palais by Judge Dredd. Moonray Tower houses giant refracting lasers which beam through the sky at night to project messages onto the Moon. Large corporations, such as Sunshine Synthifoods, pay huge sums to have their advertisements beamed onto the lunar surface whilst the very rich pay to send messages to each other.

As might be expected, the crimes committed in Mega-City One go beyond the normal crimes of today. Umpty Bagging is the illegal sale of Uncle Ump's Umpty Candy, a candy with the most wonderful taste the world had ever known, a taste so good that it was addictive. To protect the citizens, the authorities exiled Uncle Ump to space, but gangsters found him and, forcing the recipe from him, returned to set up illegal umpty factories. Now Uncle Ump's Umpty Candy is sold again on the streets by unscrupulous umpty baggers. Stookie Glanding is the factory farming of the alien Stookie species whose adifax gland prevents ageing in humans. With citizens hungry for youth, the Stookie glanders still prosper, although most factories are now hidden in the Cursed Earth. Body Sharking is the illegal dealing in the bodies of living humans. Behind the front of a cut-price Home for the Semi-Dead, where dying citizens can be kept in suspended animation, the body sharks grant loans with 100% interest rates. For security they place a relative or loved one in suspended animation. Failure on the payments means the plug is pulled and the 'security' sold off in parts through the sideline of organ legging.

Thus the sagas of Judge Dredd progressed through various series in Mega-City One and the Cursed Earth to arrive at the recent Apocalypse War – all out nuclear warfare with East-Meg One of the Sov Bloc. With the war finally won, Mega-City One is slowly returning to 'normal' in recent issues of *2000 AD*.

The Dredd game

The rise in popularity of Judge Dredd has led to the syndication of the strip to other publications. He has been running in *The Star* on Saturdays for over a year (ironically, toned down for the newspaper) and deals are being concluded for his appearance in the USA and France. And there is even talk now of a film . . .

Although Dredd has been around for over five years, it has only been recently realised that he is a strong enough character to support merchandise products using his name. Licensed posters, candles, badges, models, softback reprint books have all appeared recently and, in September, 1982, came Judge Dredd – the game.

Being a Dredd fan myself, the idea first came to mind two years ago. It was clearly a massive task as the comic strip was evolving weekly and so many buildings, events, crimes and criminals *had* to be included to capture the full flavour of Mega-City One. Looking through all the back issues I felt that a board/card game would be ideal to bring out both the humour and the events. It was essential to bring in as much player interaction as possible to make arrests both challenging and amusing. The game had to appeal, both to the large number of youngsters who followed Dredd, and also to the teenagers and adults who might enjoy a Judge Dredd game.

I decided that Mega-City One, as far as the game board was concerned, would be restricted to New York City and divided into sectors, each named by a well-known building and the time would be set prior to the Apocalypse War. Each player would be a Judge, roaming the city in an attempt to arrest as many criminals as possible.

In the game six crimes occur at once in various parts of the city. The perp is not known until a Judge reaches the scene of the crime. Random placement of crimes and perpetrators ensures crazy events, *eg,* Judge Dredd might be caught Driving Too Slow or The Angel Gang might be caught Umpty Bagging.

A game turn consists of two phases: *movement,* during which Judges move to the scenes of the crimes, and *arrest,* where Judges use various means of combat equipment to make their arrests. Combat is carried out by adding the value of the crime and perp to the roll of 1 die and comparing it with a Judge's combat value plus combat cards added to the roll of 1 die, these being modified, perhaps, by the use of Action Cards held by the Judges.

Arrest Example

A Judge (Combat Factor 5) is attempting to arrest Ice-Pink Brown (Combat Factor 7) who is Robot Smashing (4) – a total so far of 11.

The Judge plays the Sonic Cannon Card (+5) and the Tweak Card for an extra die roll. Another player plays the Flabbon Card (–2) on the Judge (current Combat Factor 8 plus an extra die roll). The Judge plays the Fergee card for another extra die roll, whereupon another player plays the East-Meg Spy Card on the Judge giving the Perp an extra die roll. The Judge then plays the Block Mania Card on himself choosing the Plasteen Riot Shield option at the bottom (+2). Nobody wishes to play any more cards on the roll; the Judge's Combat Factor is 5+5–2+2=10 plus his normal die roll plus two *extra* die rolls. The Perp's Combat Factor is 11 plus his normal die roll plus one extra die roll. (It's not as complicated to play as it sounds!)

The Perp rolls 3 and 6 – a total Combat Factor of 20. The Judge rolls a 4, 1, and 6 for a total Combat Factor of 21. The Arrest is successful. However, along comes another Judge who gleefully informs the arresting Judge that he has not arrested Ice-Pink Brown – it was good old Edwin Parsey up to his tricks!

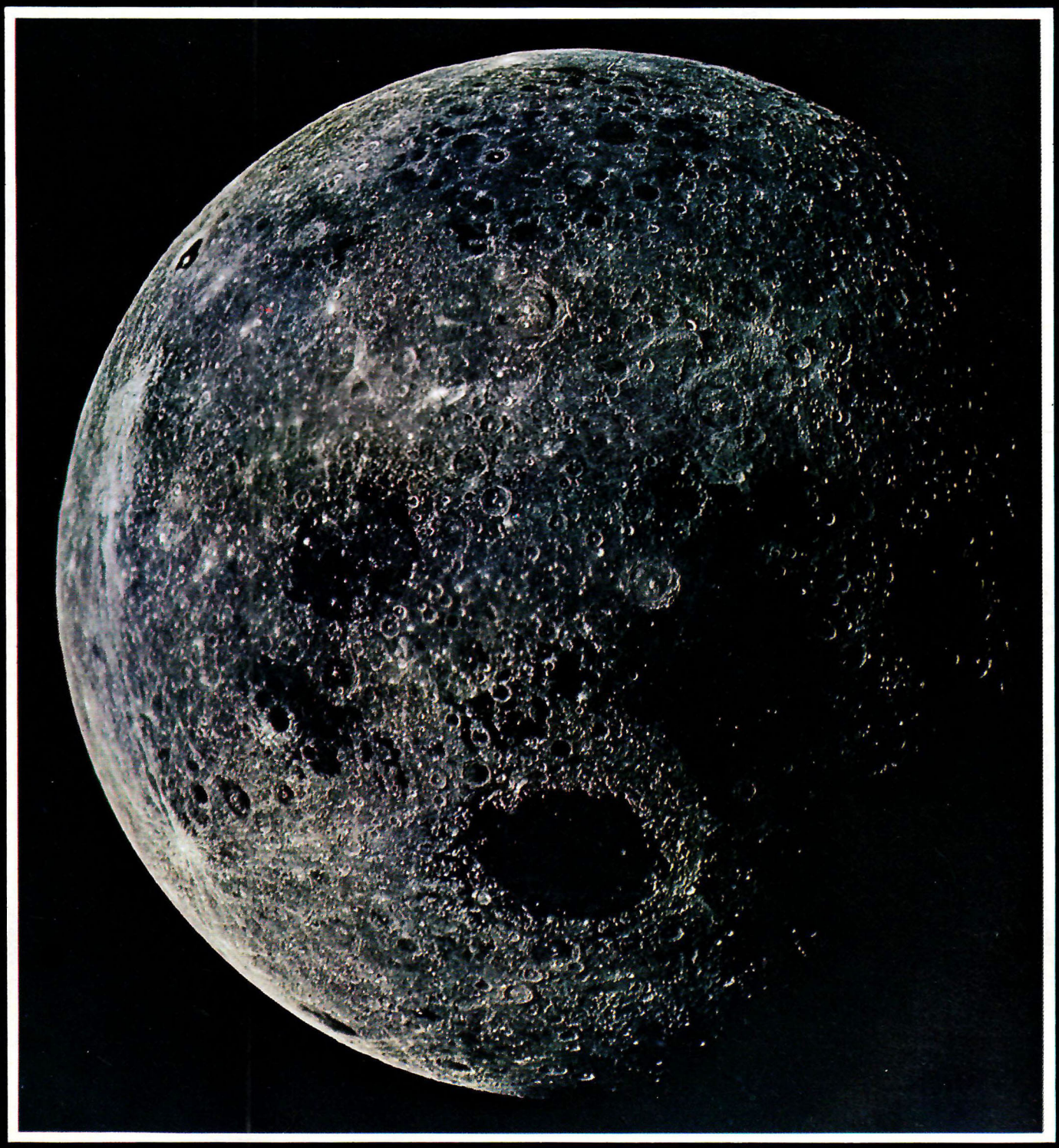
SPECIAL
IN THE CONFUSION OF THE BATTLE, THE PERP YOU HAVE ARRESTED TURNS OUT TO BE EDWIN PARSEY, THE MOST NOTORIOUS CONFESSOR OF OTHER PEOPLE'S CRIMES IN MEGA-CITY 1. YOU SCORE NOTHING FOR YOUR ARREST AS THE REAL PERP HAS ESCAPED. DISCARD THE PERP AND CRIME CARD.
SPECIAL
SERVES ME RIGHT!
OR
OR
OR
YOU STUN THE PERP WITH TRANQ GAS BEFORE MOVING IN. ADD 2 TO YOUR COMBAT ROLL.

Judges defeated in combat go to Justice Hospital in bloody defeat and the winner is the player with the most Arrest Points.

Notwithstanding the merits of the game *as* a game, its popularity is also due to the fantastic artwork. It is generally agreed that much of the cult following of Dredd can be attributed to the bold and dynamic artwork of Brian Bolland. And it was he, who despite other major commitments, very kindly agreed to paint the box art. Ian Gibson, *2000 AD*'s Robo-Hunter illustrator, also agreed to paint the complicated board. The cards were then designed using original artwork from the Dredd comic strip itself. The overall production programme was masterminded by Albie Fiore. As background information for people unfamiliar with Dredd, it was decided to include Jack Caldwell's Old Fashioned Umpty Candy Album in the game. This is meant to resemble a cigarette type card album and give illustrated descriptions of all the crimes, perps and buildings of Mega-City One featured in the game.

THE MOON -OUR COMPANION WORLD

BY PATRICK MOORE OBE



Long ago, when the Moon was believed to be a god, it was worshipped in many countries. Later it was regarded as a world: 'earthy, with valleys and ravines', to quote a description from Ancient Greece. Still later it was studied telescopically, and assumed to have continents, seas and even life. Today, we know different. The Moon has never known life, except that which has been taken there from Earth, but it is no less fascinating for that, and despite the Rangers, *Luniks*, Surveyors and Apollos there is still a great deal about it that we do not know.

Once Man had landed there in July, 1969 – how long ago that seems! – it was tacitly assumed that all lunar problems would be solved 'at a stroke'. This has not happened. It has been said that every astronomer regards the Apollo findings as confirmation of his own pet theory. In particular, those who believe the craters to be of volcanic origin continue to do so; those who regard them as impact structures are just as confident. Still, there are some puzzles which have been cleared up. As recently as the early 1960s many astronomers still agreed with Dr. Thomas Gold that the lunar seas, or maria, were deep dust-drifts into which any landing rocket probe would inevitably sink. Had this been the case, manned flights to the Moon would have remained well nigh impossible, but fortunately the surface has been found to be pleasingly firm.

Theories of crater origin are almost as numerous as the craters themselves. (By 'crater' I include all walled circular formations, from tiny pits up to the huge ramparted plains well over 150 miles in diameter, even though the term is not technically good.) The main argument today centres upon whether the main cratering process was due to internal forces; (vulcanism, using the term in a very broad sense) or external (meteoritic impact). The truth is certainly that both processes have operated to a considerable extent. Unquestionably there has been widespread volcanic action in the past, and although the rocks brought home for analysis are either igneous or volcanic, with surprisingly little meteoritic material, impact craters must have occurred as well, just as has been the case on Earth.

One interesting discovery has been that the Moon is not so totally inert as used to be thought. Of course, major structural alterations belong to the remote past; there has probably been no large crater produced on the Moon for the past thousand million years. Yet small-scale, localized glows and obscurations have been noted by attentive Earth-based observers; they are known as Transient Lunar Phenomena, and their sites are associated with moonquakes recorded by the seismometers left on the Moon by the Apollo astronauts. They seem to be due to gaseous emissions from below the outer crust. However, any tremors will be much too mild to pose any problems for a future Lunar base.

Top right, Apollo 17 EVA, and Scientist/Astronaut Harrison H Schmitt is standing next to a huge, split lunar boulder at the Taurus-Littrow landing site. At right, taken from the command module of Apollo 10, is an oblique view of the western portion of the so-called Sea of Tranquility – the second landing site selected for the Apollo 11 manned landing. **Photos: NASA.**

The main features on the Moon's familiar face are the vast grey plains, still mis-called 'seas'; the mountain ranges, most of which make up the boundaries of the circular seas; and, of course, the craters, together with ridges, domes and valleys. The naked-eye observer can make out all the principal seas, such as the Mare Imbrium (Sea of Showers) and the Oceanus Procellarum (Ocean of Storms). With binoculars many craters can be seen, and a few nights' work with good binoculars and an outline map will soon enable the beginner to find his way around. But beware! Everything depends upon the angle at which the sunlight strikes a crater or a peak. When the crater is close to the edge of the illuminated part of the Moon (the 'terminator'), it may be shadow-filled and imposing. A few nights later, when the Sun has risen over it, the shadows are less, and the once-prominent crater may be hard to identify unless it has a particularly dark floor, as with the circular, 60-mile Plater, or very bright walls or central peak, as with the brilliant Aristarchus. The only way to learn lunar topography thoroughly is to observe over several months, noting the ways in which the appearances of the main features change. Full moon is the worst possible time for observing, because there are virtually no shadows, and the whole scene is dominated by the bright streaks or rays which come from a few bright craters, such as Tycho in the southern uplands.

Mapping the Moon's far side

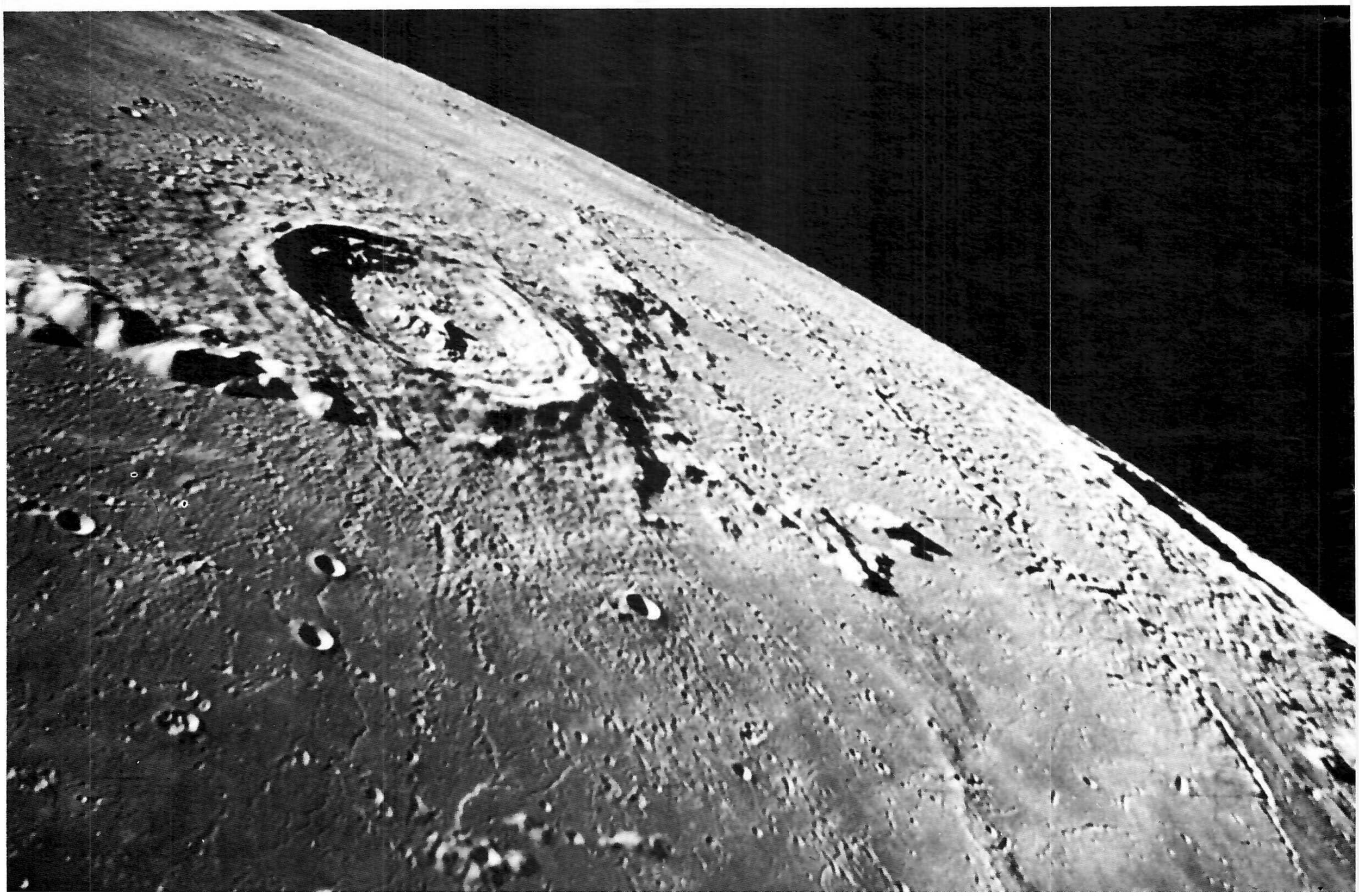
The Moon takes 27.3 days to complete one journey round the Earth. It also takes 27.3 days to spin on its axis, so that it keeps the same face turned Earthward all the time. Before the Space Age, we knew nothing definite about the far side. (To show what is meant, walk round a chair, turning as you go and keeping your face turned toward the chair; anyone sitting on the chair will never see the back of your neck – just as we on Earth never see the 'back' of the Moon!) Actually, there are various effects, known as librations, which do cause a slight wobbling motion, and altogether we can examine 59% of the total surface, though never more than 50% at any one moment. However, features near the edge of the visible portion are so foreshortened that they are difficult to map. The new era was ushered in by the unmanned probe *Luna 3* in October 1959; the rocket carried cameras, and made a trip round the Moon, sending back the first pictures of the hidden regions. Since then, of course, the Orbiters and Apollos have provided us with detailed charts of virtually the entire surface. The far side is not identical with the familiar side; there are no major dark 'seas', although one feature, the Mare Orientale, or Eastern Sea, does extend well onto the hidden area. (I have a fatherly interest in the Mare Orientale, because I discovered it when I was mapping the Moon's libration areas around 40 years ago, though I had no idea then of its importance!)

Obviously the Moon is more accessible than any other celestial body, because it is so close to us and because it always keeps company with us as we travel round the Sun. Few astronomers now believe that it and Earth ever formed a single globe, but the materials making up the two worlds are much the same, and so are their ages – between 4.5 and 5 thousand million years. But there the similarity ends. The lunar atmosphere is so thin that it may be regarded as, to all intents and purposes, non-existent. This is understandable enough in view of the low escape velocity – only $1\frac{1}{2}$ miles per second – but it has meant that life never gained a foothold there. One disappointment has been that the lunar rocks contain no trace of 'hydrated' (watery) materials, so that there can be no chance of extracting water from them as was hoped before the Space Age opened. In fact, the Moon will give no real help to future colonists. What, then, are the chances of setting up a base there?

Colonisation?

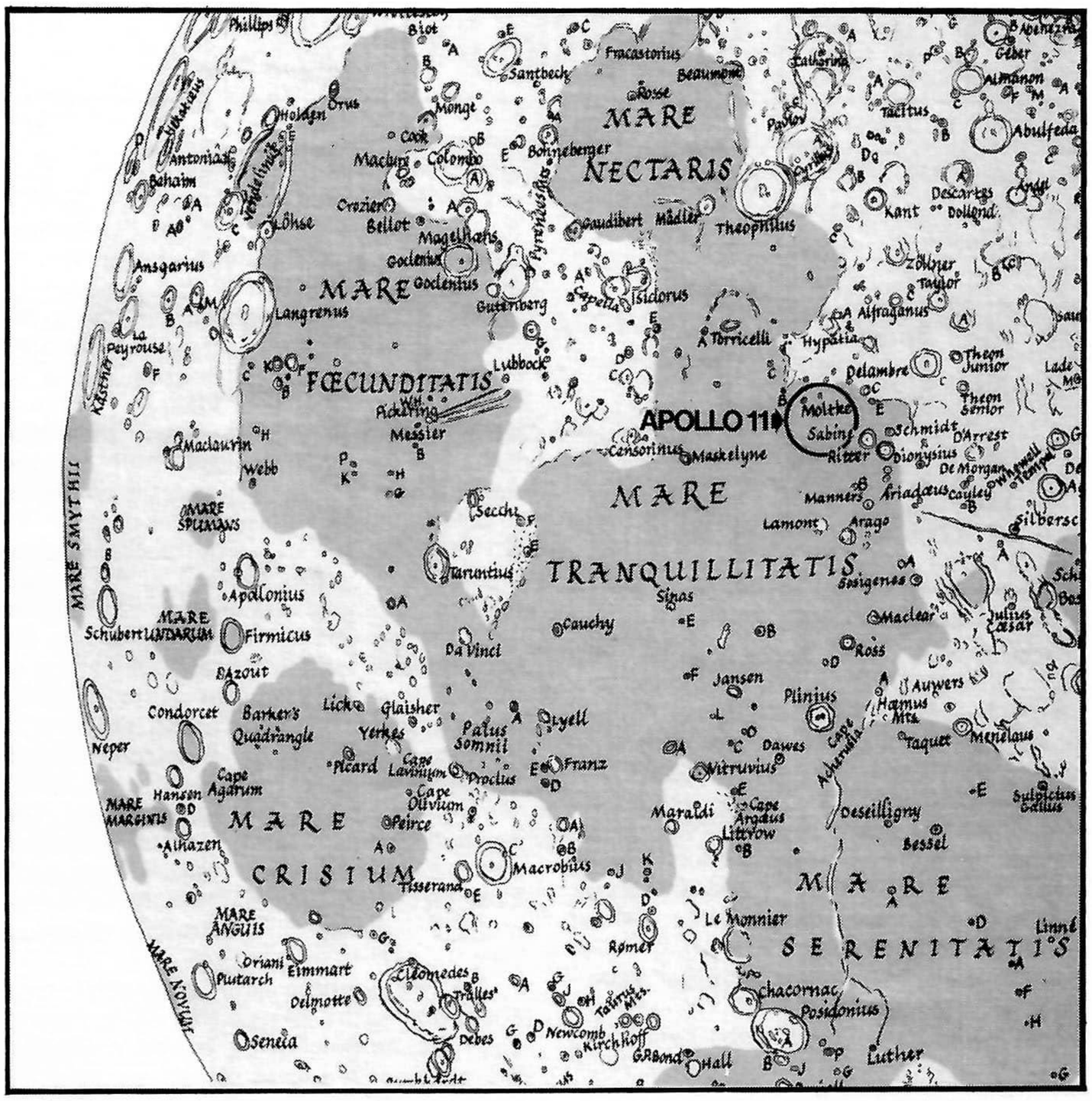
To be candid, the only question to be answered is not 'Can we do it?' but, 'Do we *want* to do it?' Technically, a fully-fledged base could certainly be set up before the year 2000, and it would be of tremendous value to all mankind. With its lack of atmosphere, its low gravity and all its other special characteristics, the Moon will be an ideal place for a scientific laboratory – and I do not mean only an astronomical observatory; medical researchers will find the lunar base of vital interest to them. Just what form the base will take remains to be seen. The graceful, domed structures pictured long ago by pioneers such as Wernher von Braun may turn out to be not so very far from the truth.

One branch of science which will benefit immeasurably is radio astronomy. On Earth, conditions are becoming steadily worse as commercial and private broadcasting

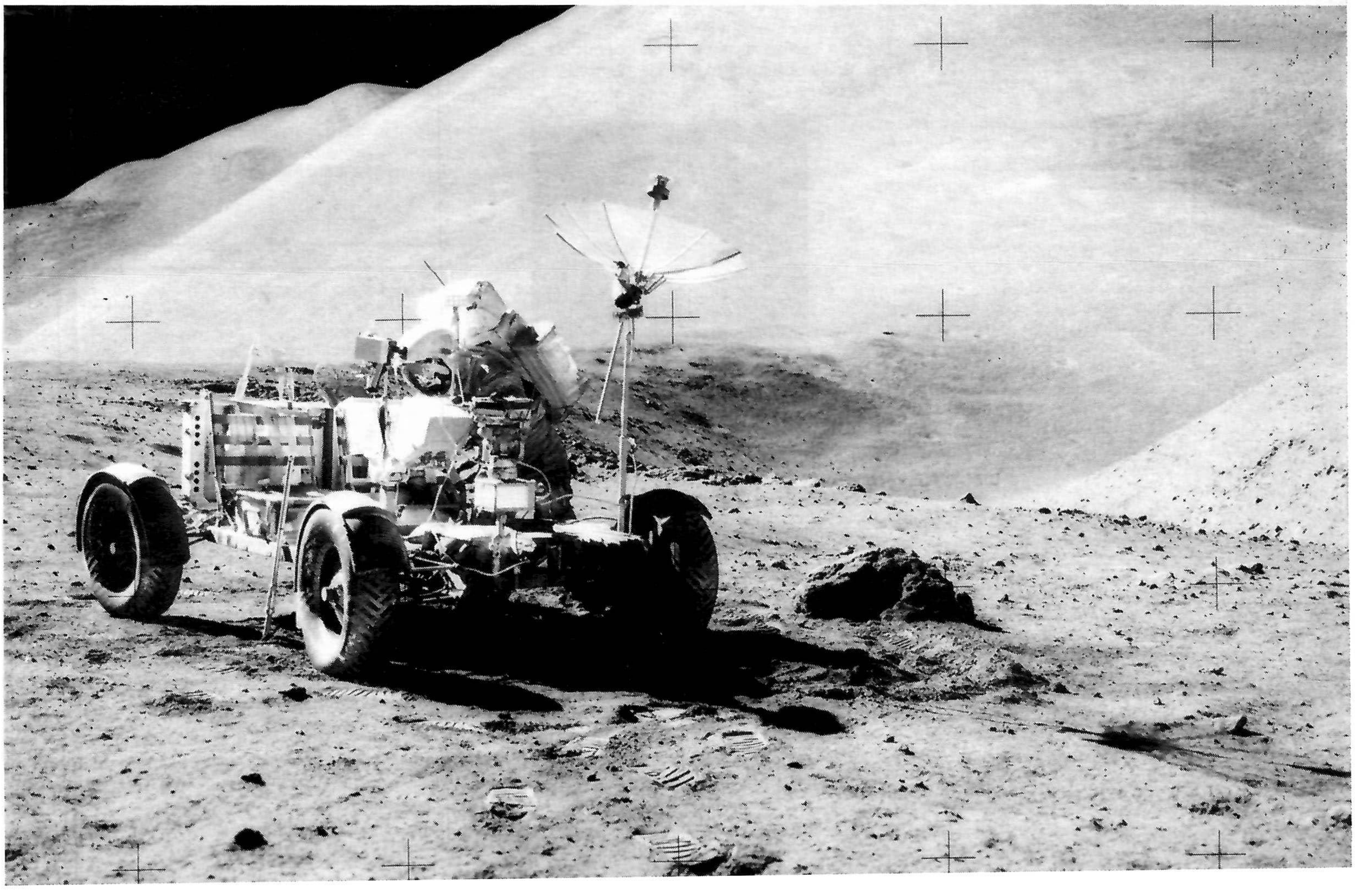


increases, and Sir Bernard Lovell commented to me quite recently that unless something could be done, radio astronomy would have become impossible within 20 years. But the far side of the Moon is totally shielded, and will be completely radio quiet. No doubt something of the sort will be attempted in the foreseeable future.

We must agree that any lunar base will have to be truly international, so that the rate of progress depends more upon politics than upon technology. But this is looking some years ahead; meanwhile, the Moon shines down as it has always done – beautiful and romantic, even if the lunar scene was so aptly summed up by Colonel Edwin Aldrin, of Apollo 11, as 'magnificent desolation'. Sooner or later, men will return. Let us hope that it will be sooner. If not, then the Moon is prepared to wait. ●



Opposite, Eratosthenes Crater, looking southward from the Apollo 17 CSM, Copernicus on the horizon. Apollo 17 was the last lunar manned mission, being launched on December 7, 1972. Below, Apollo 15 EVA. Astronaut David R Scott, commander, works on the Lunar Rover at the Hadley-Apennine landing site. Hadley Rille is at the right centre of the picture while Hadley Delta (in the background) rises approximately 13 124 feet above the plain. Photos: NASA. *At right, a section from the author's outline map of the Moon available as a large 30 ins × 36 ins poster print from Mrs P A Helen, Lower Birchetts, Langton Road, Langton Green, Tunbridge Wells, Kent, TN3 0EG. The map retails for £2.45, including postage.*



SOUND & VISION

DISCS

Space Invaded – BBC Space Themes. *BBC Records. REH 442.*
A few years ago I compiled *BBC Space Themes* for, surprise, surprise, **BBC Records.** It started a healthy trend and they later brought out detective, comedy and sporting theme records. Then they said, 'can we do a Volume 2?' Actually, there weren't enough new themes available to fill a new album, so we have *Space Invaded* instead. Working with William Gierson of BBC Records, we ended up with a short list of tracks and while he sorted out the engineering side, I wrote the sleeve notes. The latter got slightly out of hand, though, and I ended up inventing a character called 'Captain Zuup' who took over the back of the album completely!

The music itself consists of new versions of old favourites: *Dr Who* and *Tomorrow's World,* a different version of the TV *Star Trek* theme (no, the original *still* hasn't been released), the themes from *Blake's 7* and *Cosmos,* the latter of which also has another Vangelis piece called Alpha, used in the series, and from the Vangelis album *Albedo 0.39*. The *K9 and Company* theme is present, along with *Sky at Night's At the Castle Gate* from Sibelius' *Pelleas and Melisande*. The Space Shuttle coverage used Aaron Copeland's *Fanfare for the Common Man,* which was on the first album as the Apollo-*Soyuz* music. However, this is a different recording. One of the final tracks is, for a change, some of the incidental music to *Dr Who*. This is by the Radiophonic Workshop's Peter Howell and from The Leisure Hive. It's a very good piece of music in its own right and could almost be a theme. Also you'll find some of the music to the Nigel Calder spoof *The Comet is Coming,* this time by Malcolm Clarke of the Radiophonic Workshop. Final track is the original Tim Souster version of the Eagle's *Journey of the Sorcerer* as hitched about all over the Galaxy.

Incidentally, at the time of writing the soundtrack to *Blade Runner* does not exist – whatever the credits at the end of the film might say. **Polydor Records,** who issue Vangelis' music, say that he will not do a soundtrack album. Any record that purports to be the soundtrack will only be 'music from', and I would think that copying the Vangelis sound is going to be difficult anyway. **MI**

Star Trek II. The Wrath of Khan. *Atlantic K 50905.*
The best thing about *Star Trek – The Motion Picture* was the music, one of Jerry Goldsmith's best scores. Consequently, I awaited the soundtrack album to *Star Trek 2* with bated breath, only to find it wasn't by Goldsmith. Instead the music has been composed by James Horner, but seemingly in the same mould as the first film. In fact the score actually opens with the original television theme by Alexander Courage and Gene Roddenberry, although this rapidly develops after that famous fanfare into the new *Wrath of Khan* theme with more than a passing resemblance to Goldsmith's *ST 1*. This includes (intentionally, I suspect) the use of a glockenspiel to emphasise a certain passage of the music; play the first soundtrack album and you'll see what I mean. Although definitely a film (as against a television) score, there are traces of the old TV series' incidental music – themes that always cropped up at particular points of the story – the way good incidental music should, that makes me wonder if James Horner did any of the TV episodes? Unfortunately even one of the most avid *Star Trek* enthusiasts I know, Marion van der Voort, can't locate any publication that lists the incidental music composers for the various episodes. Who knows?

The film did have its faults (I don't mind Scotty playing the bagpipes but did he *have* to play Amazing Grace?) but, overall, it was just like an expanded wide screen, six track TV episode – which is how *Star Trek* should be. Trekkers will have got the album anyway, but for other mortals who haven't contemplated the purchase, it's a good soundtrack album and worth a listen whether you liked the film or not. **MI**

E.T. The Extra-Terrestrial. *MCA. MCF 3160.*
E.T. is John Williams' best soundtrack to date. Well, I reckon so anyway! It completely captures the essence of the film and works as a piece of music in its own right. Yes, it is still a soundtrack recording, but has many of the attributes of symphonic scores by Richard Strauss or Prokoviev, or half a dozen other relatively-recent composers. There are hints of other famous scores entwined into the music, most notably – and most appropriately – *Close Encounters,* heard as the second track, or movement if you prefer, starts, and E.T. is pursued, after the film's tranquil beginning. Williams' also adds two instruments that he doesn't usually employ – the harp and the piano. The former comes in at the beginning of the third track 'E.T. and Me', when Elliott first finds his new friend. The piano comes into its own with the second side of the album on 'Over the Moon', with a little melody that could very easily fit into a 1950s-style film.

The *Star Wars* influence is there, of course, though not obviously so; snippets of the brass scoring suggest moods from both the films and the *E.T.* theme itself shares a common root with the main *Star Wars* theme.

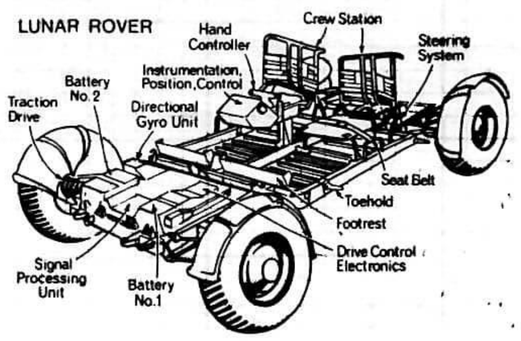
One notable omission is the lack of the LSO. As with *Close Encounters,* with the film being mainly entirely State-side, it, presumably, wasn't deemed necessary to come to Britain just for the scoring. Consequently an anonymous session orchestra is used, which is a pity for so symphonic a score. Unfortunately, Los Angeles doesn't have as many orchestras to its name as London and perhaps the Los Angeles Philharmonic was busy elsewhere. Admittedly, they did play the score to *Battlestar Galactica,* but I would have thought that *Close Encounters* or *E.T.* were far more worthwhile doing . . . **MI**

Heartlight. *Neil Diamond. CBS. A2814.*
It had to happen. Along with the landslide of *E.T.* dolls, thermos flasks, bicycles, chocolate sweets, video games, sweatshirts, bed-covers, *et al,* comes a 45 single based on the Spielberg/Rambaldi character. Neil Diamond partly wrote *Heartlight* in collaboration with CB Sager and the widely-acclaimed Burt Bacharach, and the result is not all bad. It's a melodic, catchy little number and neatly paraphrases the storyline of *E.T.;* the lyrics are typically lightweight. For example: 'Turn on your heartlight, Let it shine wherever you go, Let it make a happy glow, For all the World to see' . . . Hmm. To his credit, Diamond manages to avoid referring to E.T. by name and the sleeve is similarly devoid of any association. Perhaps Spielberg had a hand in that. **RLR**

VIDEO TAPES

The Lord of the Rings *(Thorn EMI)*
Released in VHS and Beta formats. 127 minutes. Colour.
Dwarfs, Hobbits, elves; the world of Tolkien's cult Middle Earth brought to vivid life by Ralph Bakshi and his team of animators. It's all very clever and the introduction of live action battle sequences, painted over by artists, creates surreal imagery. Fans of the story can relive their heroes' adventures with enjoyment but to those unfamiliar with the story, as this reviewer, it seemed rather confusing after one showing. Despite the technical excellence of the film and the impressive sound recording, qualities fully retained by Thorn EMI's video presentation, I confess to a slight feeling of disappointment. Yet I do not feel that to be a criticism of the film. Much of the appeal of Middle Earth lies in reading the book, forming one's own mental images of such characters as Frodo Baggins, Gollum, Gandolph, the Black Riders, etc. Colleagues who have read the book prior to seeing the film attest to this and, I suspect, within lies the reason for the huge following of the BBC Radio Four serialisations of recent years. **RLR**

Time After Time *(Warner Home Video)*
Released in VHS and Beta formats. 108 minutes. Colour.
London, 1893, and HG Wells (Malcolm McDowell) reveals his latest creation, the time machine, to a group of invited guests including one Dr. Stevenson, a friend of HG's. As the assembled visitors marvel at the device, the police call with news that another Jack the Ripper victim has been found in the area. Stevenson is suspected but cannot be found, having been transported to San Francisco, circa 1979. When the time machine automatically returns, Wells follows his former partner into the future, determined to bring him to book. Screenplay of *Time After Time* was handled by Nicholas Meyer whose recent triumphs include *The Wrath of Khan,* the second *Star Trek* film. McDowell turns in a creditable performance as a nineteenth century man caught up in the modern world. His enemy, the villainous Stevenson, is played by David Warner, currently to be seen as Sark in Disney's *TRON*. *Time After Time* is an unusual science fantasy romp and has many original moments throughout; quality, both picture and sound, is high. Recommended. **RLR**



Apollo 16 Nothing So Hidden and **New View of Space. (Istead Audio Visual)**
Released in VHS, Beta and 'U' Matic formats. 28 minutes each. Colour.
Two videos from **Istead Audio Visual** in their NASA Science Series should be of considerable interest to spaceflight enthusiasts. The range consists of a wide number of films, mostly covering the Apollo missions although additional titles can be made available on application. *Apollo 16* brings us pictures of the Lunar Rover bouncing along the Moon's surface and an inside look at Mission Control during the flight. Crisply edited, and with a fascinating no-nonsense commentary, Apollo 16 is a valuable educational record of man's supreme achievement.

New View of Space is somewhat different in that it attempts to show the widest possible range of space images (20 000 it's claimed) within the 28 minutes of the video. This is accomplished by much use of split imaging which can often become irritating if the subject matter is dull. Happily, in this case, it isn't, and this *pot pourri* of space age wonders; satellites, Moonscapes, rocket launches, Moon missions, etc., is full of surprises.

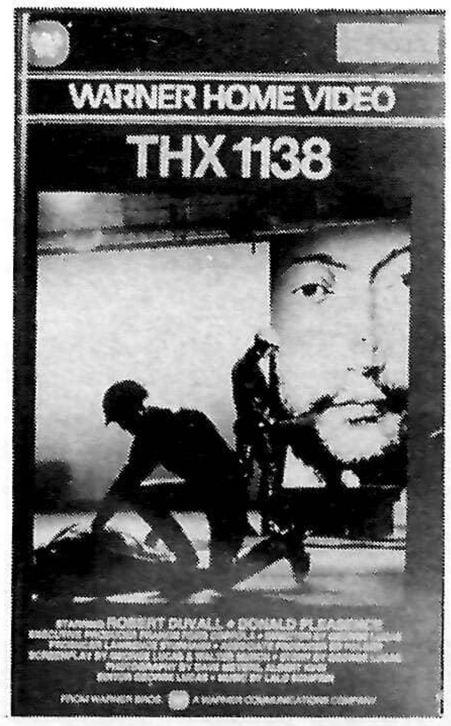
NASA tapes are available in the UK from Istead AV at 38, The Tything, Worcester. **RLR**

UFO Journals. *(VCL Video)*
Released in VHS format. 92 minutes. (U) Colour.
Rather a lacklustre UFO documentary where the lunatic fringes of the cultists are given full reign to expound their wildest theories. Supported by the usual crop of UFO pictures, each offered up without comment as 'evidence', the film does little for the serious study of Ufology as it appears so one-sided. Few of the offered pictures are 'new', indeed several are known proven fakes, admitted by the perpetrators themselves in published references of recent years. An opportunity to produce a truly balanced look at the UFO has been missed here; the recent BBC *Horizon* documentary showed how it should be done by concentrating on specific cases and looking, seriously, for rational explanations.

Those who are involved in serious UFO analysis are not helped by the contactees, meditators and 'UFO spotters' who, enjoying media attention, throw the whole subject into ridicule and muddy the waters for those scientists endeavouring to solve the riddle once and for all. **RLR**

THX 1138 *(Warner Home Video)*
Released in VHS and Beta formats. 88 minutes. (X) Colour.
George Lucas' futuristic view of a world where human beings have evolved into a race of robots and sex is looked upon as a criminal activity to be stamped out. Robert Duval and Donald Pleasance skilfully turn in the thankless roles of *THX 1138* and SEN 5241. Each human has a number, not a name, and normal responses are kept in check by drugs, robot policemen and constant surveillance.

In this depressing scenario lives THX 1138 and LUH 3417 (Maggie McOmie) who break all the rules; they eschew the drugs, make love and conceive a child to the fury of SEN who



claims that programmed computers designated THX as *his* room mate. But Duval is otherwise occupied and reducing his drug allocation affects his work output, a serious offence. Eventually he is arrested and imprisoned. Later, he discovers that SEN has also been taken into custody and, together, they explore their new world subsequently meeting a man who claims he can help them escape. If you want to know more you'll have to see for yourself but if Lucas fans are expecting a *Star Wars*-type adventure, they'll be disappointed. Hailed as a classic from some quarters it offers a rather horrific prediction of the future with heavy Orwellian overtones. As Lucas' first film, it is interesting fare for the true SF film fan who should be able to detect the direct reference to its title in *Star Wars;* no prizes are offered to those who know exactly when it appears!

THX 1138 was based on a 'short' that Lucas made for the Cinema School of the University of Southern California and which won the 1965 National Student Film Festival. Maybe the first version would be just as interesting if it could be made available . . . **RLR**

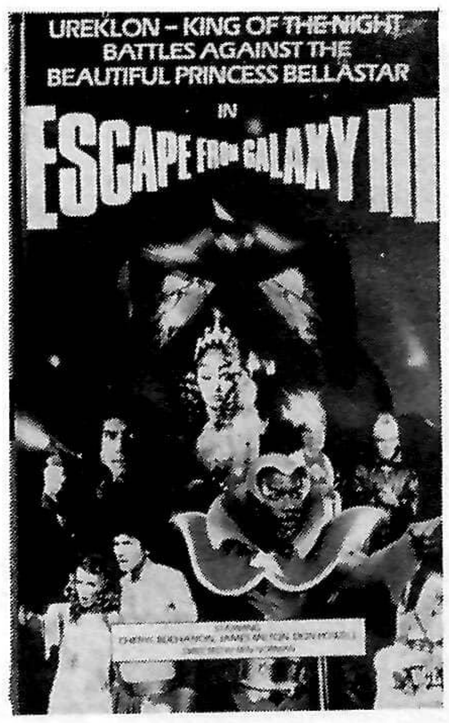


Photo Scan clue: 'BELLASTARS'

Escape From Galaxy III *(VCL Video)*
Released in VHS format. 85 minutes. Colour.
This is what could loosely be termed a 'Spaghetti Space Western' which relates a fairly predictable tale of beautiful Princess Bellastar and her spaceship captain in a lone battle against the evil Ureklan-King of the Night. *Star Wars* it isn't, and after the opening

SOUND & VISION

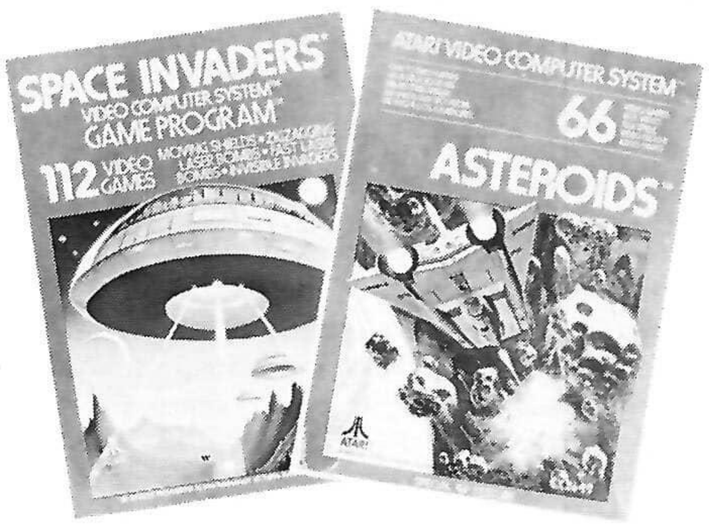
half hour of rather shaky SFX space battles, the piece shifts gear. As the princess and her consort make their escape, their ship lands on an Earth-type planet where the natives, hostile at first, become *very* friendly. After a while, these primitives 'instruct' their god-like visitors in the art of love-making and, can't you guess? Everybodies' clothes fall off at regular intervals from then on. Never mind, there's nothing pornographic about it and few will be offended for it's all done in the best possible taste! Not a film for the dedicated SF film buff, then, but budding voyeurs may take to it. Fairly harmless, but routine, hokum. **RLR**

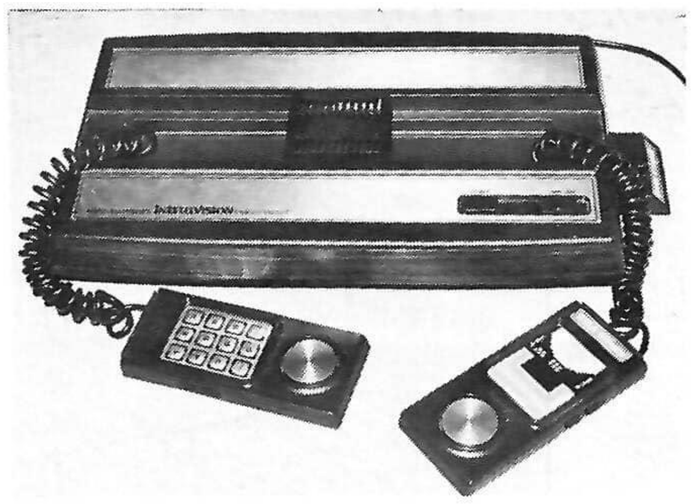
VIDEO GAMES

As this is the first of many regular video game reviews for this column, I think a brief look at the two main and well-established game systems would be justifiable. These are, of course, the **Atari** Video Computer System (VCS) and the **Mattel Intellivision** consoles.

The Atari system consists of a basic console with 'plug-in' controllers including joystick, paddle and keyboard types. The former pair are supplied with the console as well as being available separately as replacements. Price is around £95. Of these, the most commonly used controller is the joystick type (about 90%). Most games have the option for one or two players and feature a number of different game variations, the latter usually consisting of differing degrees of difficulty. With over 40 cartridges now available, the library is certainly impressive and new ones are being released every few months. At present the range includes many exciting and popular games such as *Space Invaders, Superman, Asteroids, Missile Command* and, more recently, *Pac-Man* and *Defender*. Many of these, as some people will no doubt know, started life as arcade games.

In addition to games, a number of educational cartridges are available for youngsters –





essential, I think, in this day and age – to teach children to look more and more upon the television screen as not just an amusement but also a learning and home information centre. It will be one day in the not too distant future, like it or not!

Overall, the Mattel Intellivision system has many subtle differences to its competitor but obviously still basically adopts the same principle. The console comes complete with 'universal' controllers which are attached via coiled wires. These controllers feature a keyboard with touch disc directional control and side buttons. With each game a printed plastic overlay for the keyboard is supplied, used mostly for programming the game difficulty as well as identifying the use of individual side and disc buttons. Price is around £150.

Of the 30 odd cartridges available at present most are either for one player, two players or one and two players. The games themselves lean heavily on good graphics

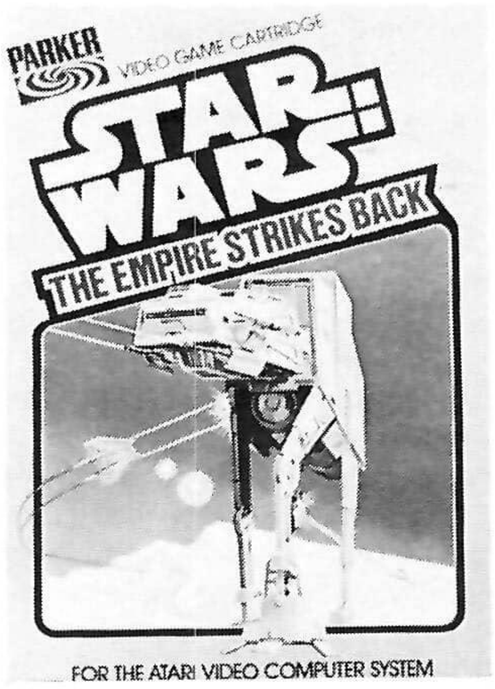
(*eg,* 3-D football pitches) which means the games are quite simple in content although they are in no way too easy or boring. Among my favourites are *Snafu, Auto Racing, Space Battle, Skiing, Tennis* and *Star Strike*.

To add to the vast range of the Atari and Mattel systems there are now three companies producing game cartridges, **CGL Activison** and **Imagic** for both, and **Parker** for just Atari; no-one should ever run out of new games to play!

Having played on both systems quite extensively I can honestly say that to choose between them is almost impossible since my likes and dislikes weigh up evenly. Anyone contemplating buying a console must, I feel, try out both systems and make their own choice. Do try more than one game on each, though, before deciding.

New Cartridges

A relatively new name in this country, producing game cartridges for the Atari console, is **Parker Brothers.** Available now are two new releases: *Star Wars (The Empire Strikes Back)* and *Frogger.*



The *Star Wars* game is based on the opening battle scenes from *TESB*. You are in a *Snowspeeder* and have to battle Imperial Walkers on the Ice Planet Hoth. The action takes place on a long (eight TV screens) landscape in which the *AT-ATs* move slowly towards your power generators. Once they reach these the sky flashes and the game ends. Along the bottom of the screen is a radar screen to show where you are in relation to the *AT-ATs*. Using joystick controllers, the direction, height *and* speed of your *Snowspeeder* is all controlled through the stick (this needs some practice to master completely). In all, a total of 48 direct hits to the body are needed to destroy a Walker whereas each of your *Snowspeeders* only survives up to five hits before crashing to the ground. Further into the game, though, you appear to be given less. Two features to help you are the ability to repair your craft twice by landing in one of the 'valleys' and, if you can avoid being hit for two minutes, you gain the power of 'The Force'. Your craft flashes all the colours of the rainbow and you are indestructible for 20 seconds. There are 32 game variations in all for one or two players. Price is £29.95.

The idea behind *Frogger* (£29.95) is to get five frogs to a home base. Each *Frogger* has 30

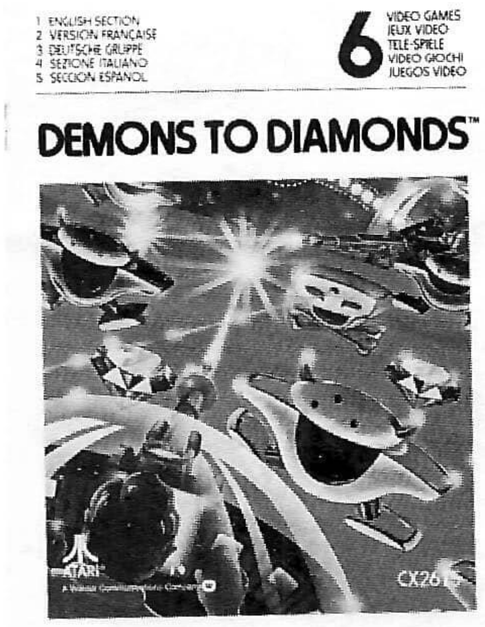
seconds to first cross a road of five lanes of vehicles travelling in alternate directions. Following this, a river filled with floating logs, turtles and alligators has to be negotiated by jumping from one to another. Obviously the idea is not to be run-over, eaten or 'splooched' in the river. With five *Froggers* brought home successfully the game begins again only at a more difficult level. At the time of writing I'm not too sure how many levels there are exactly – so far I've played up to the eighth (phew!)

Further obstacles appear in later levels in the shape of snakes that run along the river bank and later still on the large log. To help *Frogger* score more points there's a female companion, who appears on the logs sometimes, that he can catch and carry home.

Due to the game having so many elements, the cartridge is working at full capacity and there is slight flickering of some images. This is caused by the cartridge having to flash alternate images as it can only project a certain number at one time. (The Atari *Asteroids* game is another example of this). One or two players can play this with six game variations. The graphics employed on both these games are good and there's also a nice little tune at the beginning and end of each game on *Frogger*. I enjoyed playing both of these and with a further four games entitled *Spiderman, Amidar, Super Cobra* and *Reactor* promised for early 1983, I feel sure these Parker games will be well received by video game fans.

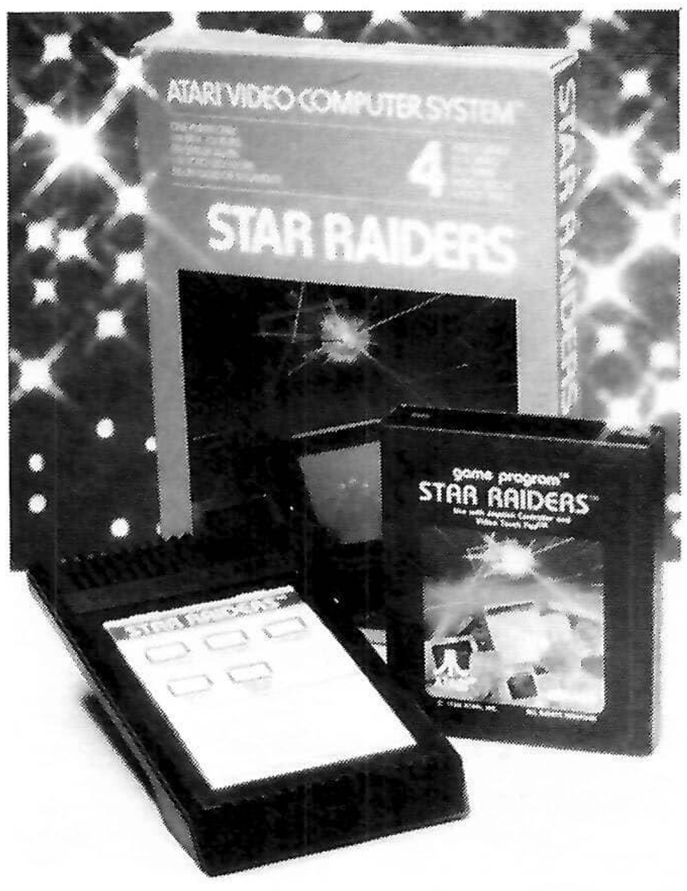
Increasing their range still further, Atari released four cartridges for Christmas 1982 – *Berzerk, Demons to Diamonds,* a youngster's educational game, *Math Grand Prix, Star Raiders* and *E.T.* to follow.

Berzerk (£29.95) is a one player game using the joystick controller. The game itself features you, trapped in various electrified mazes (touch a wall and you lose a life), chased by mindless robots who try to catch and shoot you; either of which loses you another life. The idea is to shoot all, or most, of the robots and move out through one of the exits into another maze with even more robots. Some game variations feature a character called 'Evil Otto' who relentlessly chases after you and can't be destroyed. The only way to escape him is to move to another maze. At first, the robots shoot and move at a mediocre pace, but with each new maze encountered they quicken up – it's enough to drive you berzerk!



In *Demons to Diamonds* (£24.95), one or two players fire laser cannons at the Demons which materialise and move across the playing field. These Demons appear in two colours; the object is to hit only the Demons that match the colour of your laser. These will then turn to Diamonds which quickly move across the field and disappear. If you hit one, extra points can be scored. Should you hit a Demon of the opposite colour they turn into evil skulls which shoot back at you and cannot be destroyed, although they do disappear after a while. The game is broken down into levels, when one field is cleared another appears with more, and faster-moving, Demons.

Although they are both rather simple in basic design, these two games feature good, clear graphics and need quick actions to avoid the dangers. Both are 'point-scoring' games and I've no doubt there'll be records created such as the one for the Atari *Pac-Man* which stands at an incredible 6 128 619 held by Stephen Foot of Puckeridge, Herts!



The most interesting of the releases is *Star Raiders*. This game includes a new feature in the form of a 'Video Touch Pad' which comes in the package with the cartridge. The touch pad plugs into the right hand controller jack and is used in conjunction with a joystick, plugged into the left controller jack. Your mission is to destroy all the Krylon warships before they reach your starbase. Once this is destroyed you cannot refuel or repair your ship, leaving you alone to finish off all the remaining aliens before you run out of fuel. (It doesn't last long in a battle situation.)

There are two fields of play. One, the radar screen, showing the position of you, the Krylons and your starbase. From here you programme your ship to hyperwarp to different sectors of the map. The second field (used for battle situations) shows a forward view from the cockpit and an information console across the lower part of the screen. Readouts on the console indicate remaining fuel supply, an attack computer display, remaining Krylons and status of equipment. Also, a warning of an impending attack is given by what colour the console itself is.

There are four skill levels with either 10, 20, 30 or 40 Krylon warships to fight off. No points are scored in this game, but at the end you are given a rank and class according to your performance – that is, if you survive!

Although it sounds quite complicated, after careful study of the instruction booklet and completing a few introductory games, all the functions can be mastered. I would, however, not recommend it to an absolute beginner to video gaming as it is one of the more difficult ones. Personally, I thought *Star Raiders* good to play, with some nice visual effects. Also the fact that it extends the features available up until now, giving a wider potential to this type of gaming console, is to be welcomed. **SA**

REVIEWERS
SA: Steve Archibald
MI: Mat Irvine
RLR: Ray Rimell

Latest from Atari is their unique E.T. – an exciting game which we'll be covering in detail for our next issue, published March 18.

A superb example of fantasy figure modelling. 'One Man And His Dog' was created by Robin Vondrak using the figure from a Tamiya Rough Rider kit and making extensive modifications. Clothing, weapons and companion are all scratchbuilt. Photo: John Wylie.

FANTASY FIGURE MODELLING

SOME PAINTING AND DIORAMA EFFECTS FOR MODELLERS EXPLAINED BY ART EDITOR STEVE ARCHIBALD

On his quest for the all-powerful Talisman of Moort Kyan, Allaf had travelled many days through strange and dangerous lands. None more so than the dead forest where it seemed every step that Nayl Ad, his mighty charger took there lay another skeleton of some poor wretch who had strayed into this fearful place.

Strange and eerie noises echoed through the maze of weird plant life. All around, small creatures seemed to be moving, scurrying away through the undergrowth and green mist. 'Probably Krees', thought Allaf. They were small scavengers no bigger than a man's fist but with teeth like razors. By now the axe he was carrying began to grow heavy and his hand gripped it even tighter. He tried to keep his mind on the goal which would give him the powers to win back his kingdom from the evil Vorak and his hordes.

Then, to his left, Allaf noticed that from one of the many deep, black pools that lay in wait for unsuspecting souls, small bubbles broke the surface; then larger and more rapidly. 'I do not like the feel of this,' he whispered to himself. But even before the last word had died from his lips a dark shape rose silently from the pool. A head lifted itself from an, as yet, indistinct shape. Then another, and another. Allaf's charger reared up, the rider's muscles tensed. The creature, with darting tongues, bared its huge venomous teeth and let out a loud, cold hiss which seemed to echo forever; the heads reared back ready to strike . . .

This is the scenario I envisaged whilst building and painting the **Hearne Originals** 'Barbarian on horseback' figure.

As with all white metal figures, construction is usually very simple and straightforward using five minute epoxy glue. Remember to remove any burrs, or mould lines, with a sharp, but strong, knife first. The completed figure and horse (I like to paint the two subjects individually using different techniques) are both undercoated with white cellulose primer from an Auto touch-up aerosol available from **Halfords.**

Actually, painting figures is, I think, a matter of personal choice just as it is with painting pictures. Some people prefer using artists' oil paints from a tube. With their slow drying time, shading can be applied and blended in with the base colour on the figure itself. I prefer the water-based, German-made **Plaka** paints which are a cross between poster colour and gouache with excellent covering power; even when using light colours over dark. They can also be drastically thinned down and used for tinting.

As a reference for painting all the items in my diorama I tried to copy the master of fantasy painting from his books, *The Fantastic Art of Frank Frazzeta 1 to 4.* In trying to capture his style all the figure's muscles have to be over-emphasised and shaded with dark

Photo: Steve Archibald.

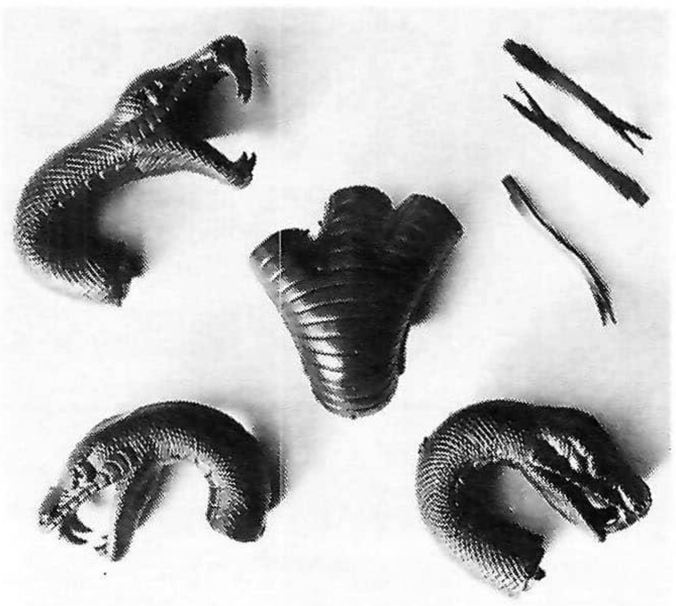
colours. Also orange shades are used on some portions of the uppersurfaces and green for some lower ones. For example, on this figure I painted a darkish shade of flesh overall then shaded muscles, etc., with gradually darkening shades of brown (see **Fig. 1**) until I was satisfied that it looked right. I then used a very *thin* wash of dark green as a tint on some (not all) of the areas which, with the figure in its normal position, face the ground. I repeated this procedure using a thin wash of orange, this time to some areas which face the 'sky'. When I was completely satisfied with all the flesh areas I moved on to paint the details using **Humbrol** *Gold, Bronze* and *Brass* or *Aluminium* and *Silver* for metallic parts.

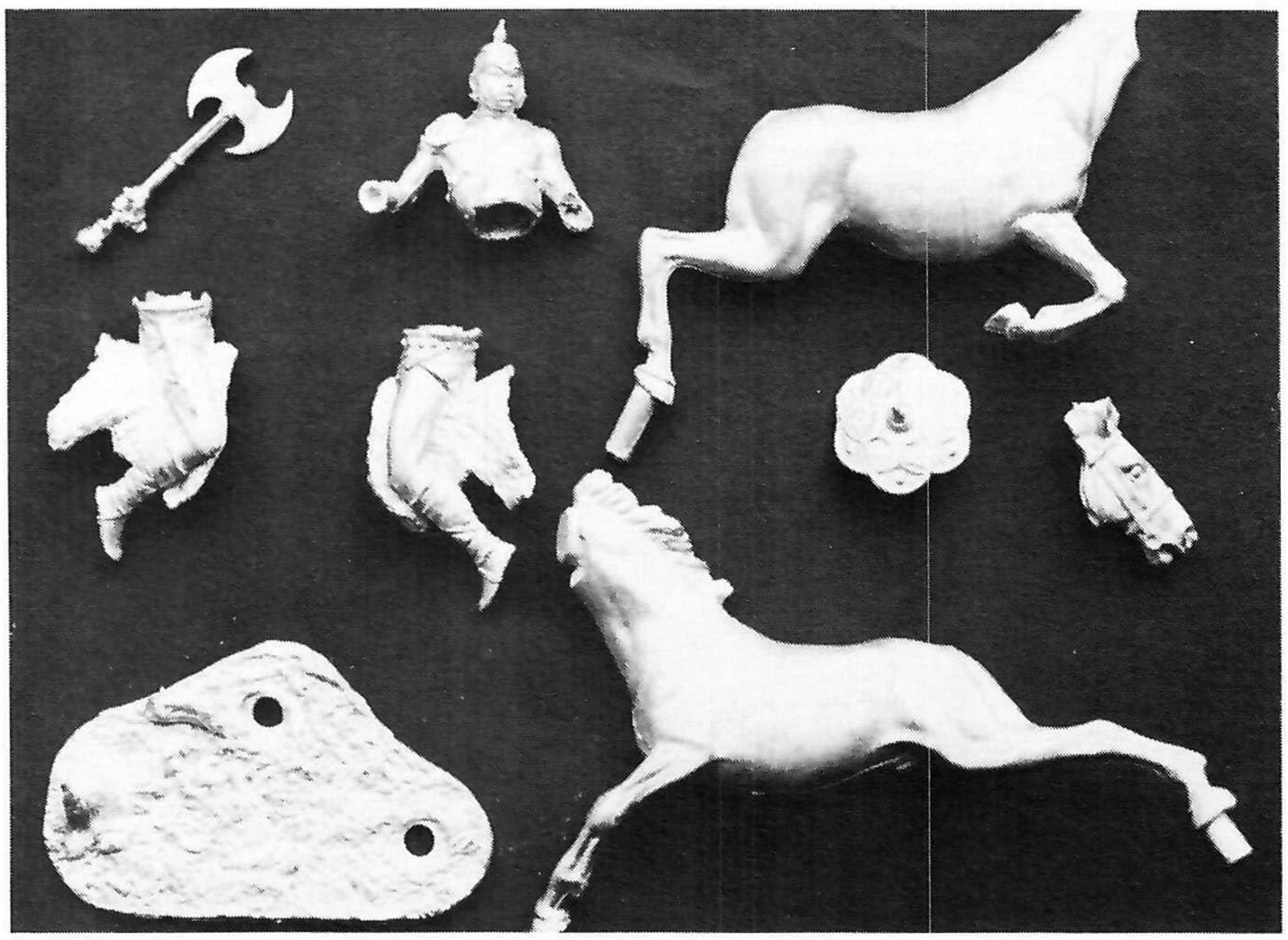
To paint the horse I used a completely different tool – an airbrush or spray gun. Still using Plaka, I first sprayed the entire horse in medium brown then added orange highlights by spraying directly down onto the model from above. Then with black, I lightly sprayed directly from underneath. As a finishing touch I *very* lightly sprayed some underneath areas with dark green. Small details such as mouth, eyes and hooves were brushed in later.

The Serpent

For the evil 'pool creature' I used the three-headed serpent from **Aurora**'s Mr. Spock kit, now unavailable. Of course you can use absolutely anything you like; that's the great thing about fantasy modelling, you simply use your imagination as a reference. One good source of monsters would be the **Airfix** range of prehistoric animals for example.

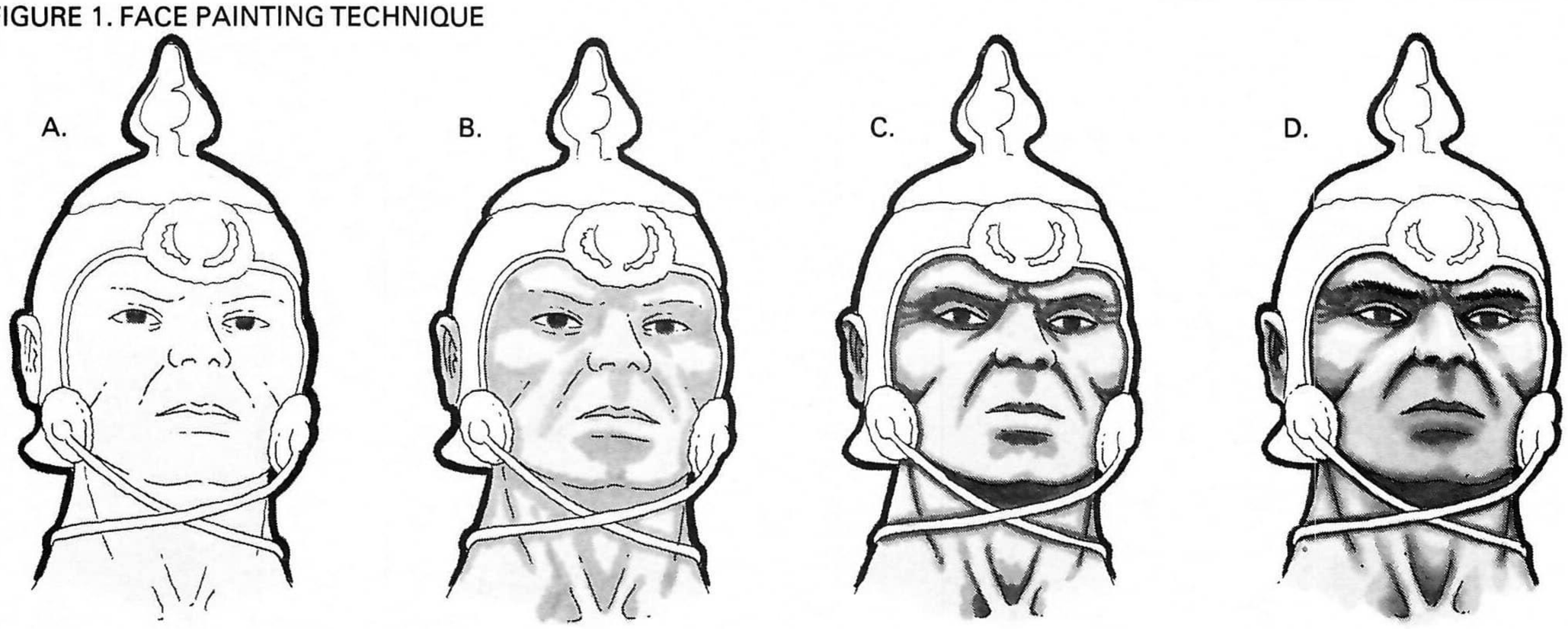
The completed creature was painted with Plaka using the dry-brush technique of applying gradually lighter colours over a dark base applied with a flat, short hair $\frac{1}{4}$ ins. wide artists' brush. The brush is filled with undiluted paint, which is then wiped almost clean, then the brush is 'flicked' several times over the object so the bristles leave paint *only on the high points.* Obviously the eyes and mouth have to be painted in the normal way. Saliva is produced by stringing polystyrene tube cement globules stretched across the jaws and 'dribbles' created with epoxy resin. Finally, the whole thing was satin varnished and the eyes and mouth parts gloss varnished (liberally). This, then, is my way of tackling basic figure painting. Others may find other techniques more to their liking – as with most things in modelling it's a case of 'try it and see'.





Top right, serpent parts of the Aurora Mr. Spock plastic kit ready for cleaning up and, right, kit contents for the Hearne Originals' mounted Barbarian figure. **Photos: Steve Archibald.**

FIGURE 1. FACE PAINTING TECHNIQUE



A. *First paint the whites and then the iris/pupil of the eyes, remembering to make the latter large enough (look in a mirror to get it right). The eyes are a most important part which can make or break a figure. Following this, the basic flesh colour is added, painting up to, and around, the eyes.*
B. *Next, a darker flesh tone is painted into the depressions of the facial features and to areas of shadow* eg, *under the chin and around the eyes.*
C. *Using a light brown, paint into the depressions once again, only this time a thinner line is needed to leave a small area of dark flesh between the basic flesh and light brown. Also small wrinkles (where applicable) can be added to the forehead and around the eyes, etc. Note that the upper eyelids have been left in dark flesh.*
D. *To finish the shading, a dark brown applied with the finest brush is used to add small details such as enhancing small wrinkles and eyelids. Also features, such as nostrils and eyebrows, can be picked out. Small highlights in light flesh are added to the crest of the nose and centre of the cheek bones. Finally, using very thin paint as a tint, dark green can be added to areas of 'beard growth' and red for the lips.*
Drawings: Steve Archibald

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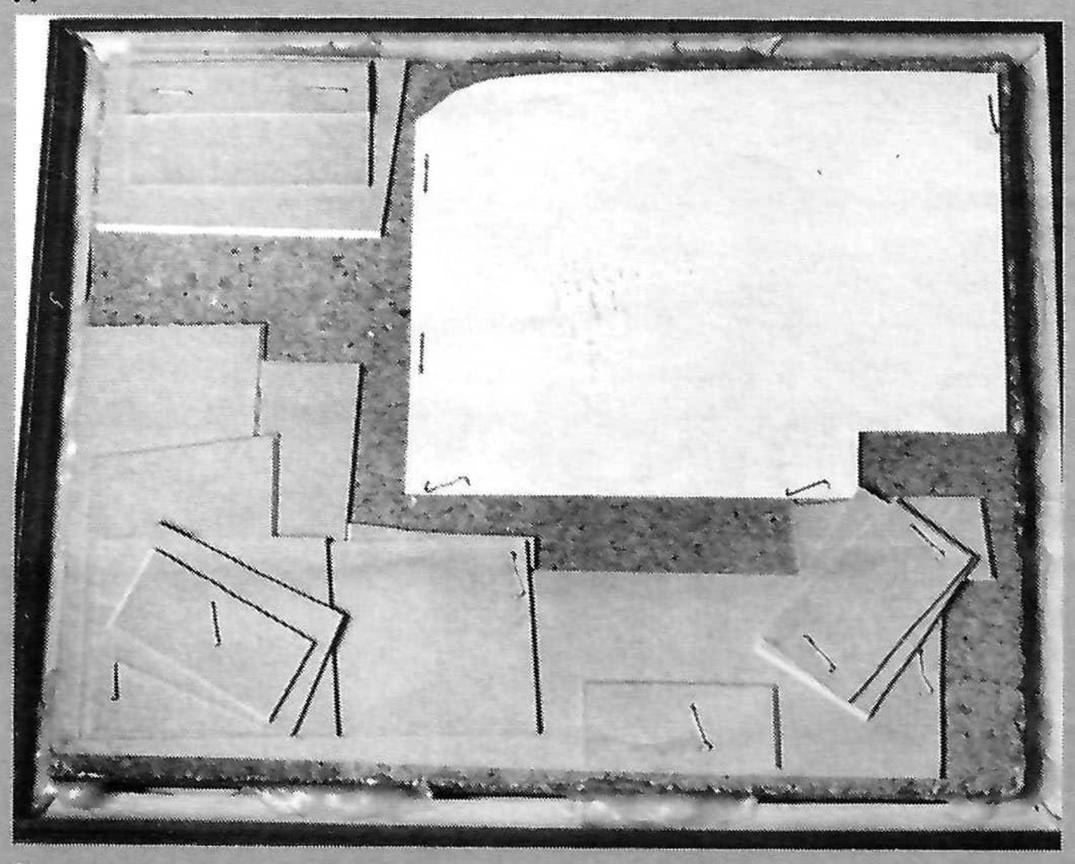

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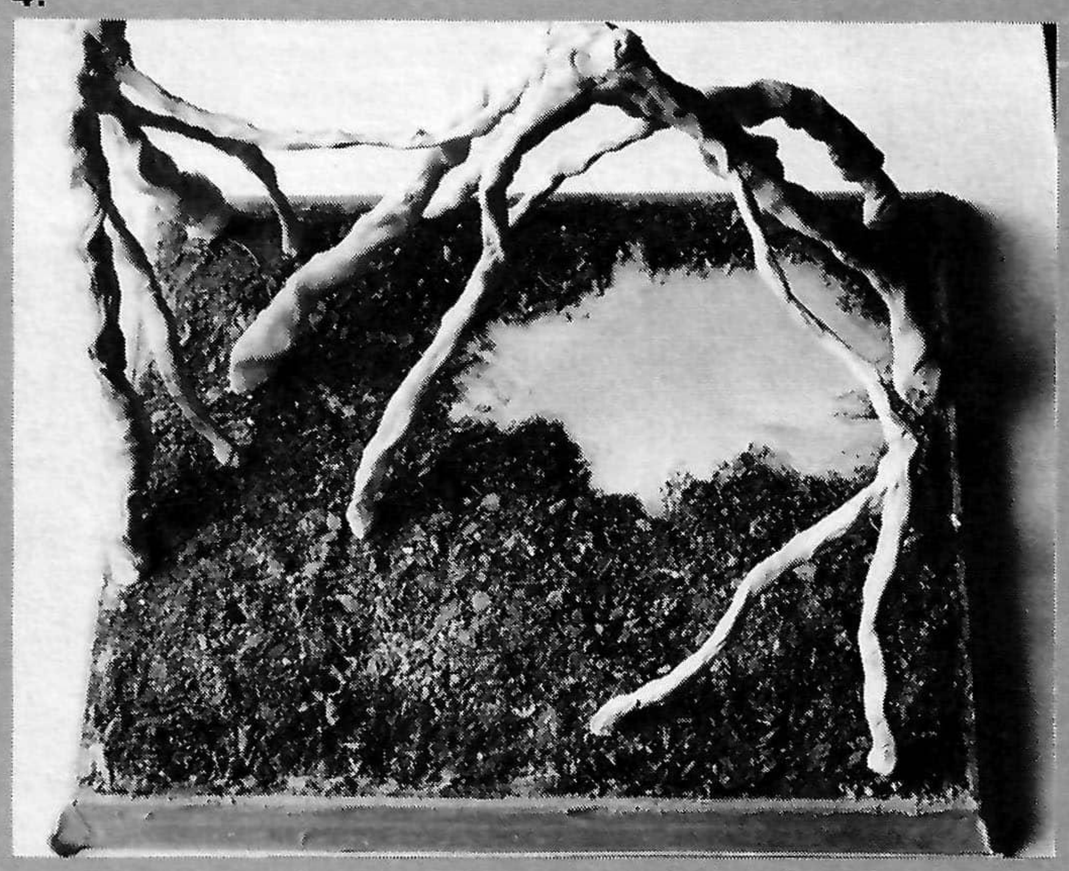


5

Modelling the base

1. The base is simply constructed from a piece of appropriately sized wood (any type will do, I used chipboard here.) This is edged with ordinary picture framing, available from artist or wood suppliers, cut to required lengths using a mitre block to obtain the correct 45° angles. The whole thing is glued with five minute epoxy. Next job was the terrain contours which were built up with pieces of cardboard stapled, glued, nailed, or whatever, in place. The area that was to contain the pool was covered with sheet plastic for a smooth surface.
2. The ground work was built up using **Tetrion** filler. Before it had dried, though, the entire board was liberally covered with dirt and smal! stones swept up from the roadside outside our offices. The excess is tipped off after a few hours when the filler has dried. Note that the picture framing is protected by masking tape.
3. The picture shows the figures being roughly positioned as a check. It is quite important to keep doing this to make sure the rest of the diorama fits in and complements the figures which are, after all, the main subjects. Also shown here are the slightly altered wire coat hangars used to give a strong base for the weird overgrown plant roots. The wire itself is glued into drilled holes in the base.
4. Here the wire frame has been covered with **DAS** modelling clay then left to dry overnight. Next, the creeping vines are added made from unravelled 'sisal' string painted black.

   As with the wire, the vines were attached through holes in the base and also glued to the roots at various points with PVA wood glue. Drawing pins held them in place until dry. The final stage before painting was to add the skeletons. These were modelled from **Milliput** separately from the base on a piece of paper and, when dry, transferred into position.
5. Painting was done almost entirely with an airbrush using overall black with touches of orange and dark green sprayed more or less at random. The skeletons were picked out by dry-brushing with medium green, orange and then cream colours. The clumps of grass, made from sisal string painted dark green, were added followed by the figure and serpent. Finally, a thin layer of glass fibre resin, about 2 mm thick, was poured around the serpent in the pool to give the water some depth. I found the best resin was the **Plastic Padding** type which is tinted yellow

WE TALK TO HARRISON ELLENSHAW, VISUAL EFFECTS CO-SUPERVISOR ON THE NEW DISNEY BLOCKBUSTER

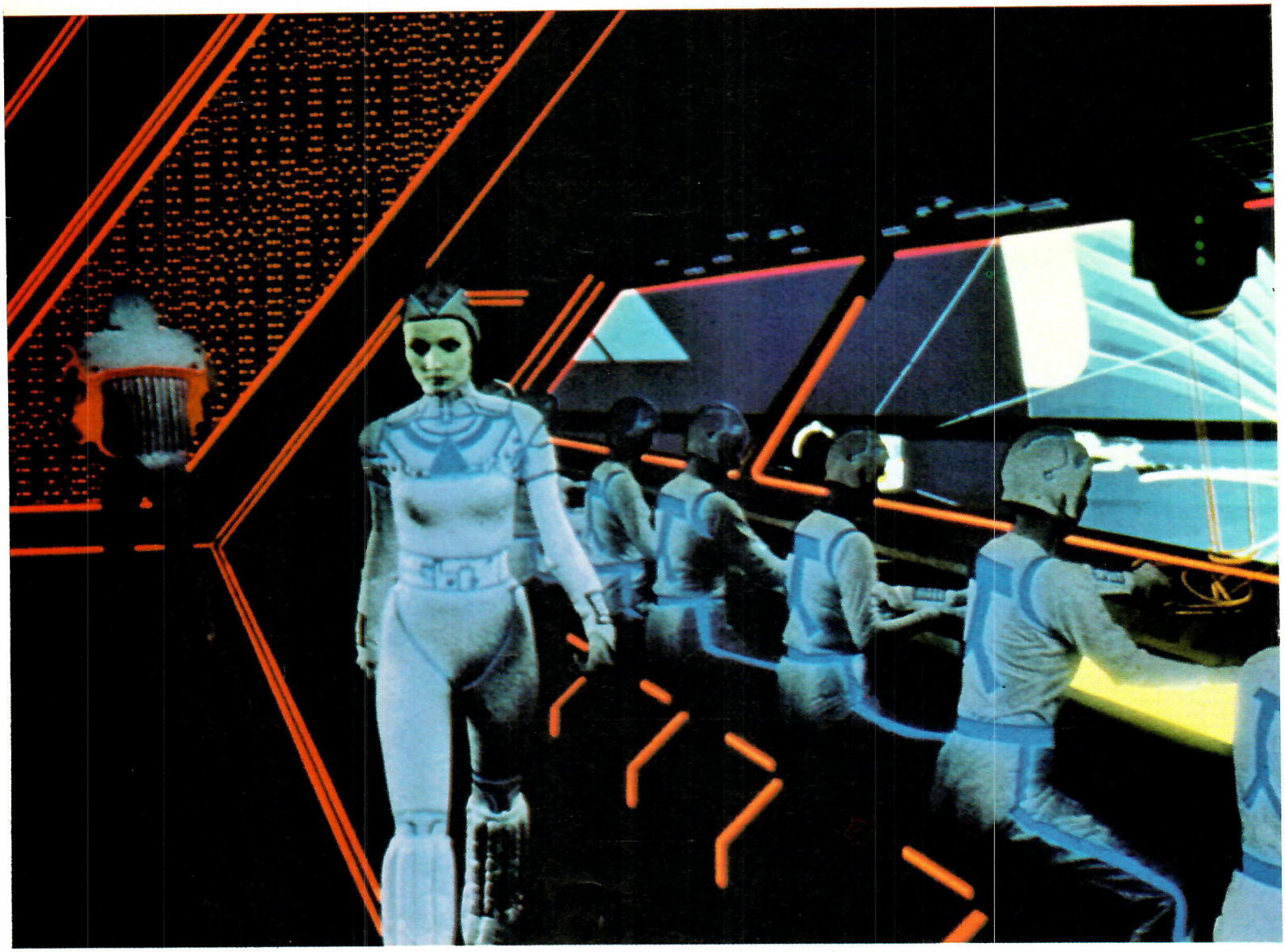
TRON

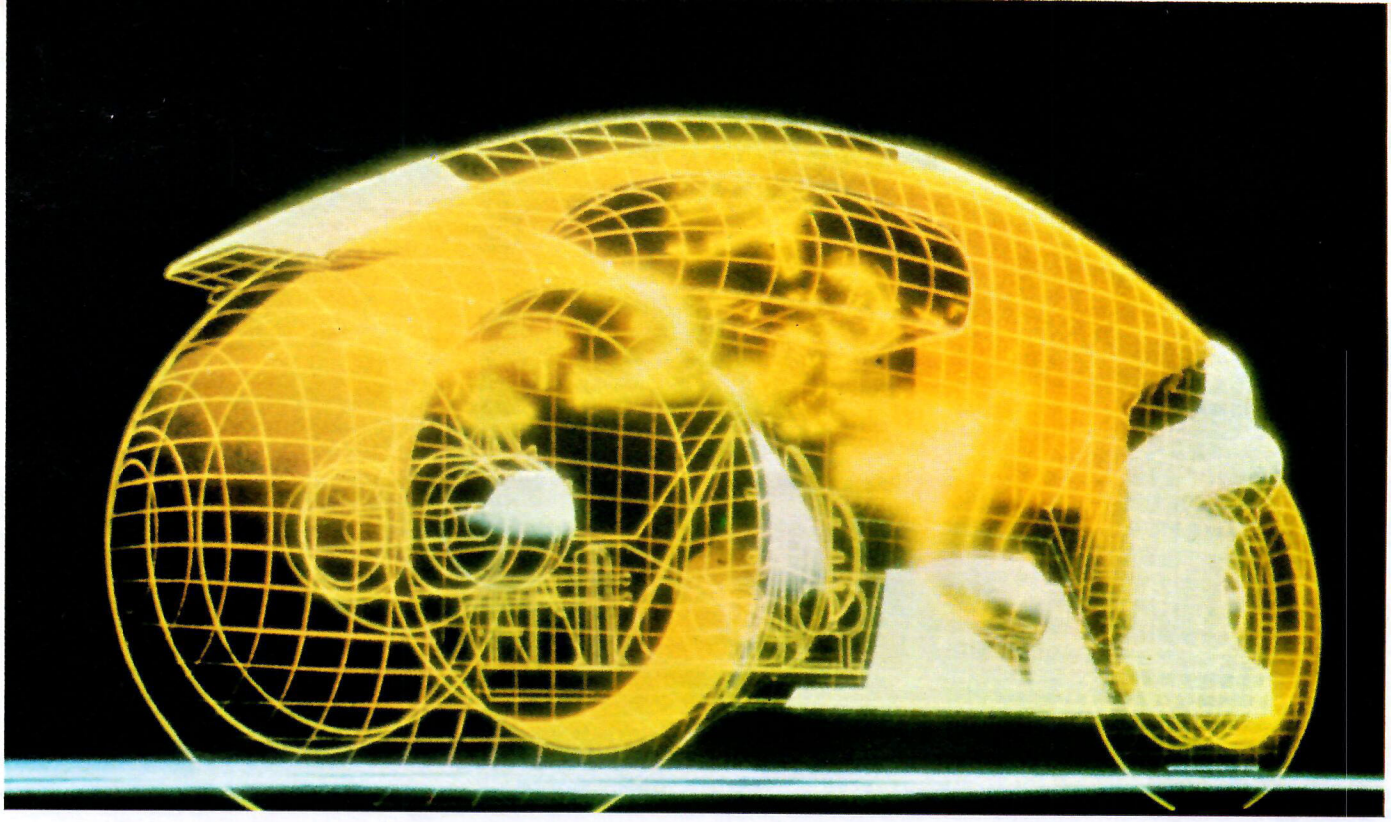
AN ELECTRONIC ODYSSEY

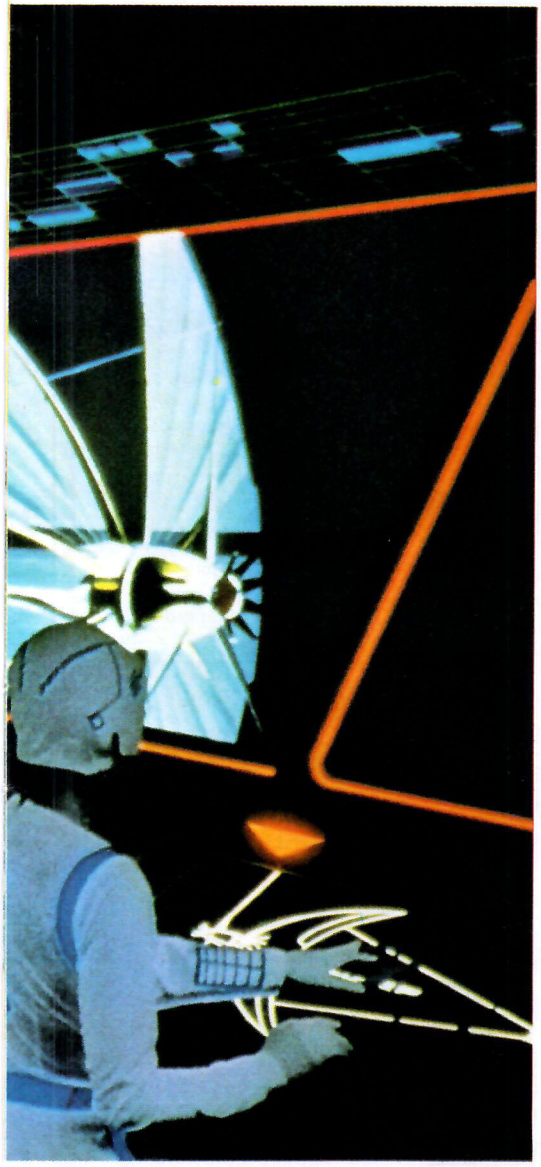
INTERVIEW BY RANDY LOFFICIER

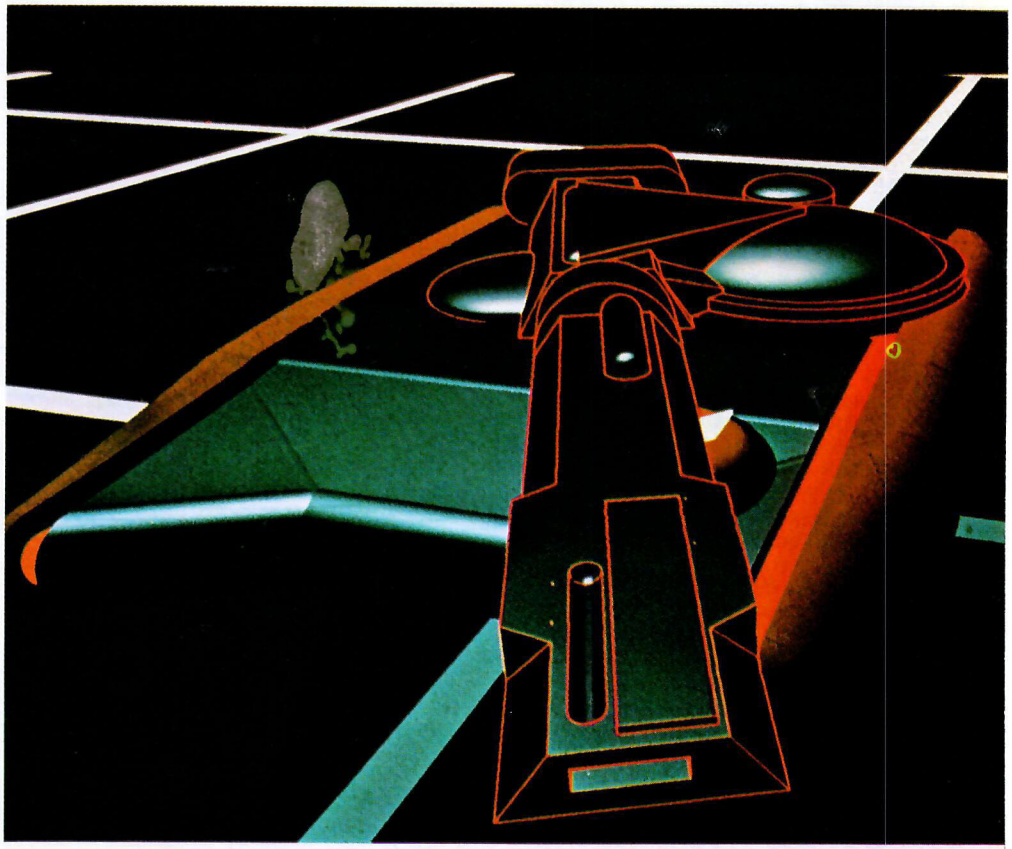
Harrison Ellenshaw's office at **Walt Disney Productions** gives more the feeling that it is his personal den rather than his business office. The walls are covered with drawings from *TRON,* and a poster showing the Mother Ship from *Close Encounters of the Third Kind* hovering over downtown Los Angeles!

Harrison Ellenshaw is the son of Peter Ellenshaw, undoubtedly one of the greatest matt artists who has ever graced Hollywood. Peter Ellenshaw's many remarkable achievements include legendary films such as *Treasure Island, 20 000 Leagues Under the Sea, Darby O'Gill and the Little People* and *Mary Poppins.* Peter Ellenshaw's crowning achievement was *The Black Hole,* for which he was Production Designer, Miniature Effects Creator and generally Supervisor of Special Effects.



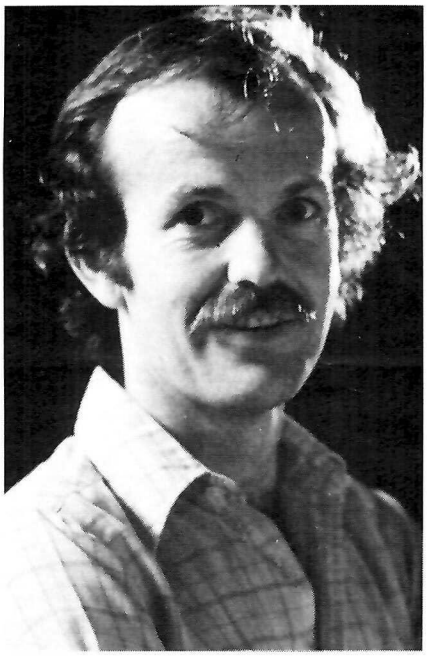






Left, in the amazing world of TRON, *Yori (Cindy Morgan) supervises the electronic simulation of the Solar Sailers. Top, the Light Cycles were among the most impressive of the computer animated graphics used in TRON. The cycles completely envelop their riders who attempt to run opponents into 'jet walls' left in the wake of the super-fast bikes.*

Above, a computer-generated video game tank prowls the simulated game grid of TRON's electronic fantasy world. The tank is a heavily armoured vehicle used by the programmes to defend themselves. All photos: Copyright © 1982 Walt Disney Productions.



Harrison Ellenshaw, or 'Pete' as he is sometimes called at Disney, was also involved in *The Black Hole* as matt artist. Before that, he had worked in the same capacity on *The Man Who Fell To Earth, Big Wednesday* and *Star Wars.* (He did the famous matt of the Death Star Power Trench.) After *The Black Hole,* Harrison Ellenshaw re-joined **Lucasfilm** on *The Empire Strikes Back,* for which he and an assistant did about 50 matts, including the breathtaking cloud city.

Harrison Ellenshaw came back to Disney for the fixing of *Watcher in the Woods,* and then was called in for *TRON.* Considered today to be among the best in the matt field, Ellenshaw is far from being, as are many technically-apt professionals, clinical and monosyllabic. He comes across as warm, knowledgeable and caring about what he does. In addition, he also has a natural knack as a story-teller, and manages to make a dry subject come alive with humour.

VOYAGER: *How did you first get involved in 'TRON'?*

Harrison Ellenshaw: I was aware of *TRON* when it was being considered by the Studio. This was about $2\frac{1}{2}$ years ago. I was living up north at the time. I had worked on *The Empire Strikes Back,* and I had just come down here to work on *Watcher in the Woods.* That consisted of taking the film that had been released, and redoing the ending. So I was involved in that while *TRON* was being talked about by the Studio. Everyone was enthused about it. I met Steve Lisberger and Donald Kushner, and after they got the go-ahead to make the film, they asked me if I'd work on it. So I was fortunate that I was in the same area at the time.

I was very enthused about it. I wanted to do *TRON* very, very badly because I felt that it was going to be significant, and that it would be something fun to work on.

So it worked out well. It was a good opportunity.

V: *Whose idea was it to do the film in this mixture of classical animation, backlighting and computer animation?*

HE: Steven's. He and Donald both felt that the computer-generated imagery would be at a high enough state-of-the-art by the time they were ready to do the picture, that it could do what they wanted it to do.

This was really the big mystery, whether or not that would be true. Luckily, it turned out that they were right. I was one of the many people who kind of doubted it. I didn't think at the time that we would get that much done in that period of time from the companies involved. Not because they weren't good, but just because it was asking them for so much! I was pleasantly surprised, I must say. I was glad that I was wrong!

The use of the backlighting technique: Steven originally intended that the characters be painted with cel paint, and the backlighting be used only for their circuitry. Richard Taylor, when he was asked to do the film, insisted that we could backlight the entire thing, set and all. He was right. It worked out far better doing it that way. It was faster, more efficient and worked better than traditional animation.

So it was Steven's idea, with a significant Richard Taylor modification.

V: *What was your job, specifically?*

HE: I've forgotten! (Laughter).

My job was to take care of the 20% or the 10% or whatever percent that didn't go right. The film really broke down into two halves. There was the figure-out-how-we're-going-to-do-it, and the get-that-going-correctly parts!

The creativity came in in the first part, when we had to decide how exactly we were going to do this or that. Steven did have the idea, Steven had done some tests, but still we had never done something on the scale that we were going to attempt – 75 000 frames of backlighting!

I basically didn't concern myself too much with the computer-generated imagery. That was being done by MAGI and TRIPLE-I and Richard kept his eye on that. I concerned myself with all of the other stuff.

Once we decided how we were actually going to do the film, we then had to decide how to do it quickly and efficiently, and with the least number of people, the smallest amount of money and all of those things. The most important of all was that we had to have it out by Summer, which was a tight schedule to say the least. We figured out the method we would use mainly on the basis of a two-minute clip that we did for the National Association of Theatre Owners' convention in Las Vegas in October, 1981. We got these two minutes together, but just by the skin of our teeth, and it was not a disaster. But it was extremely sluggish doing it. It was very inefficient. We went through a lot of problems to get those two minutes done. That was a real learning process for us.

So we ended up throwing out a lot of processes and streamlining the whole thing for the rest of the film. We had to be rolling by the beginning of the year, and be done a few months after that. So these two minutes in October taught us a lot. We got the assembly line going and then it was a matter of, once it was running, ensuring that it kept going the way it should to make the deadline date.

We set goals for ourselves which kept slipping in certain areas. But we knew that one date wouldn't slip, and that was July 9 (US date of release for *TRON.*) So we just had to do everything to see that that got done in time.

Once it got going, it worked surprisingly well. I spent my typical day kind of wandering around and finding out what was going wrong, or if something was going wrong at all. Generally, if you look for problems, you'll find them . . . So there was often the temptation of not coming in to work, figuring that there would be no problems in that case, and why make myself miserable! But really I never tried that. Maybe I should have! (Laughter).

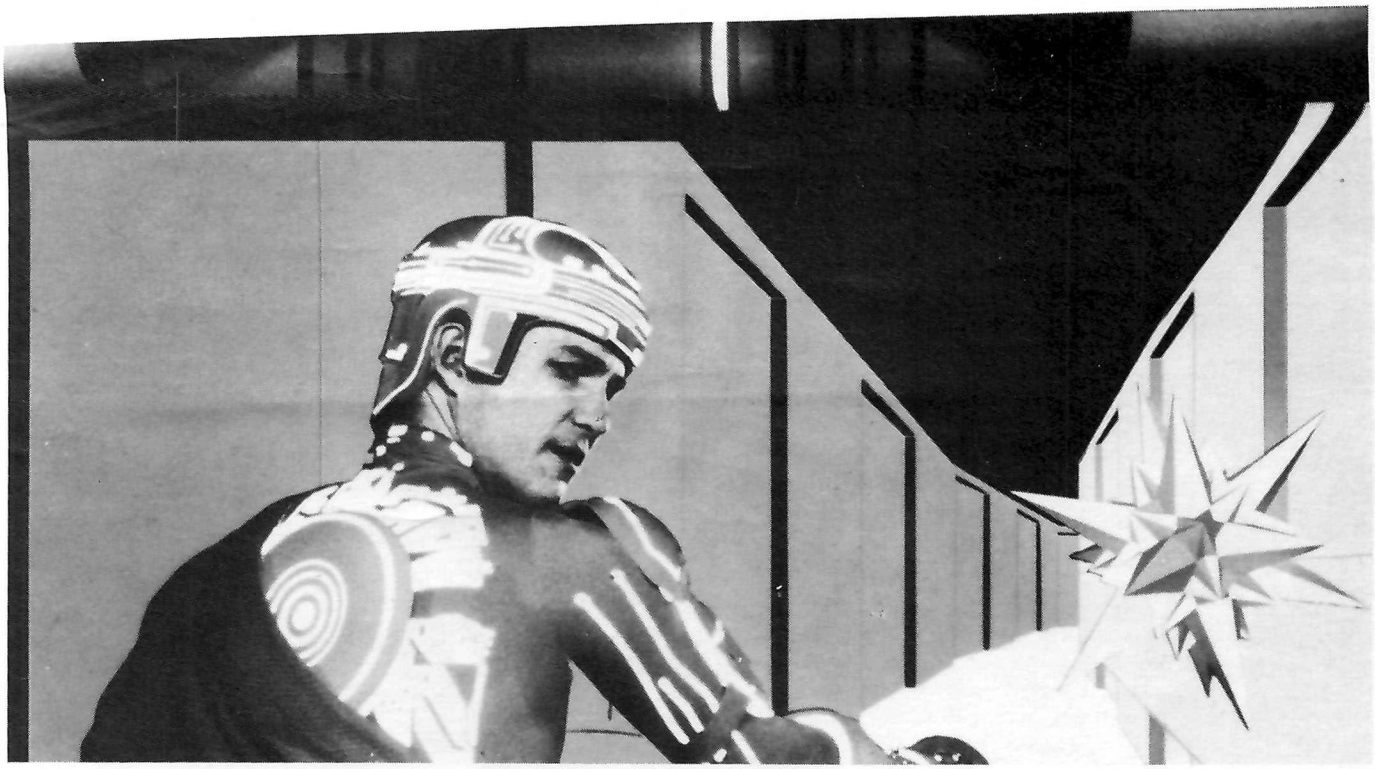
But with people working very long hours, extended hours, week-ends, the key thing that you don't want to happen is to have somebody work their little tail off for a week, not get around to see them, and later find that they have done something that doesn't fit into the system. That would really be a waste! So you were literally forced in seeing every department at least once every 24 hours, hopefully once every 12 hours. I never made once every 12 hours, I always got a little bogged down.

That's not just isolated to films, it's almost like any project. This film was such a unique kind of thing. All of this amount of work to do, this assembly line kind of idea happened. We had ten scene coordinators, and we had effects animators. Yet, I believe the film does not look as if there are that many people associated with it. It has a very smooth continuity to it in its visual look. It appears, I believe, that it is done by only a handful of people. Otherwise, you'd have some radical changes throughout this electronic world.

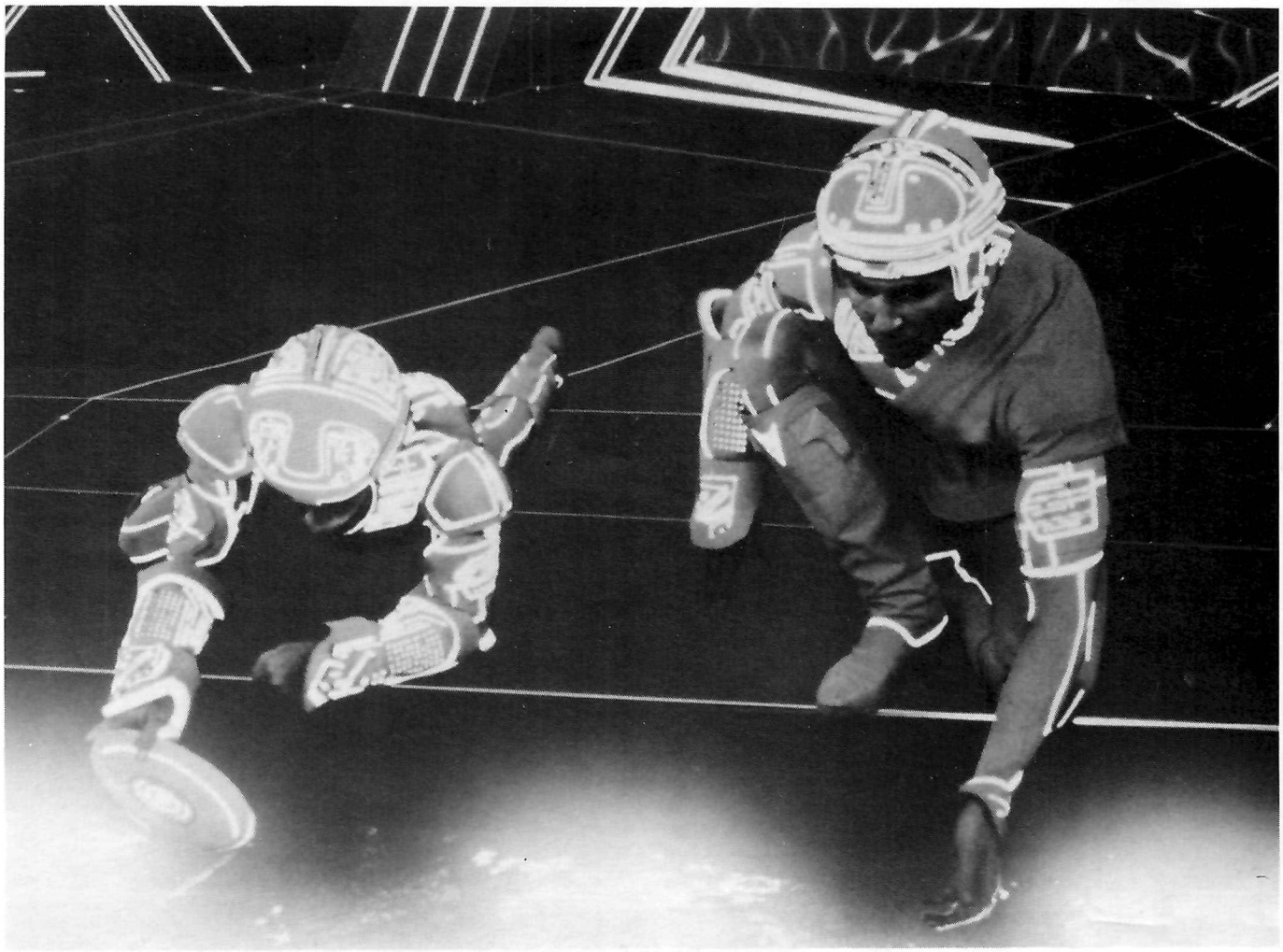
So we never really let anybody get too far off base for more than a day. That can be very demoralizing, having to re-do even a day's worth of work. We didn't have too much of that, fortunately. Most people really clicked in pretty quickly. They were wise enough, if they felt that they were uncomfortable going out on this track, that they would at least raise their hand and say 'Could someone help?' or, 'Is this going to work?', before they'd put a lot of time into it.

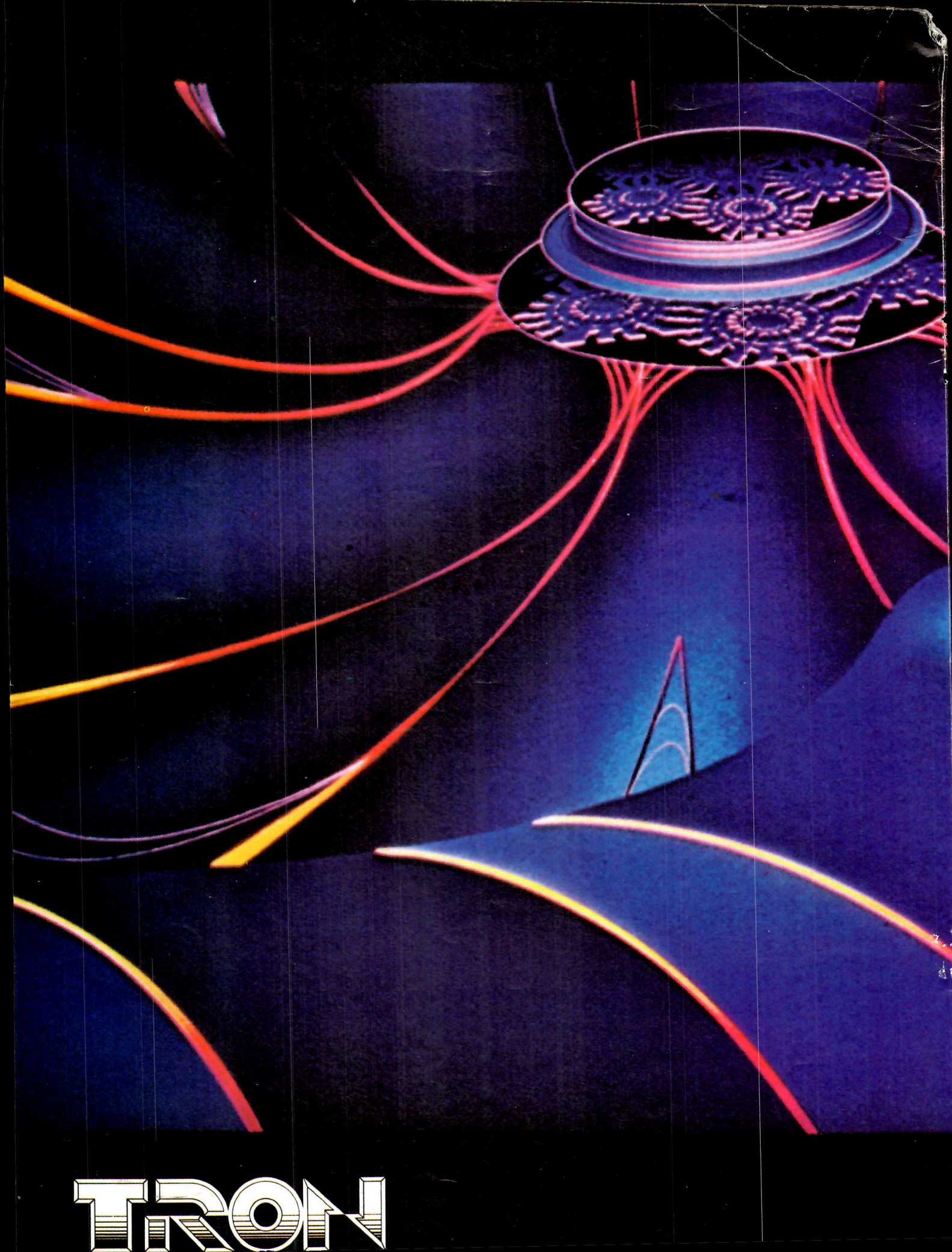
V: *How did things work out in the interface between you and the computer companies?*

HE: Initially, it was a problem with MAGI. MAGI and TRIPLE I did the majority of the work, DIGITAL EFFECTS did the Byte. Once they had looked into it, they did it very well, very effectively. Robert Abel did two main isolated sequences, so they were locals, in town, and Richard could go by and see them on his way into work. He would be by there at least once a day, then the same with TRIPLE-I where he



Opposite, TRON Visual Effects Co-Supervisor, Harrison Ellenshaw, subject of our specially extended interview. Above, Flynn (Jeff Bridges) looks askance at his frequent sidekick, a particle of computer-generated energy called 'The Bit'. Below, in this scene, Flynn pauses for refreshment with renegade programme Ram (Don Shor).
All photos: Copyright © 1982 Walt Disney Productions.




TRON

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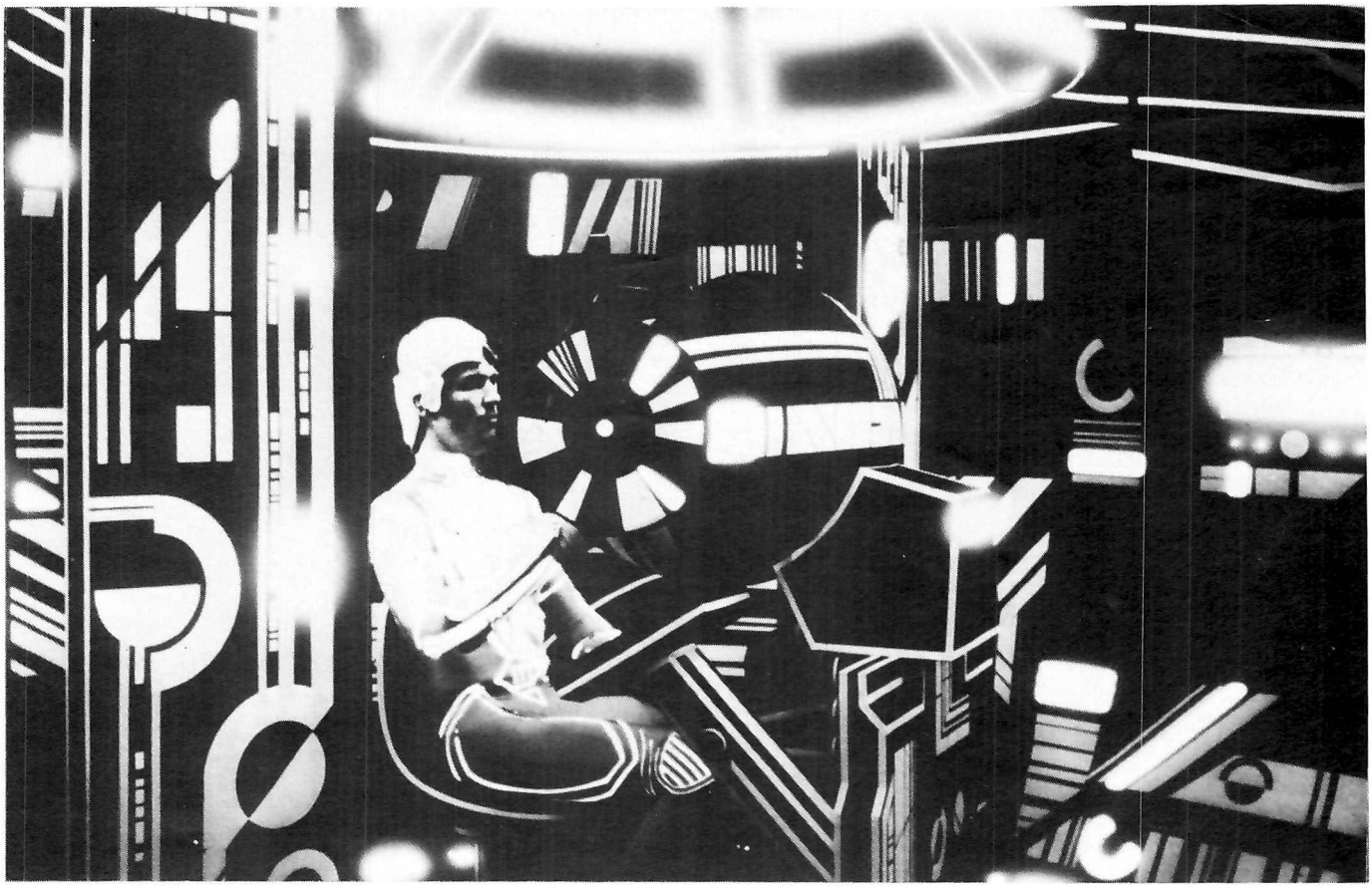
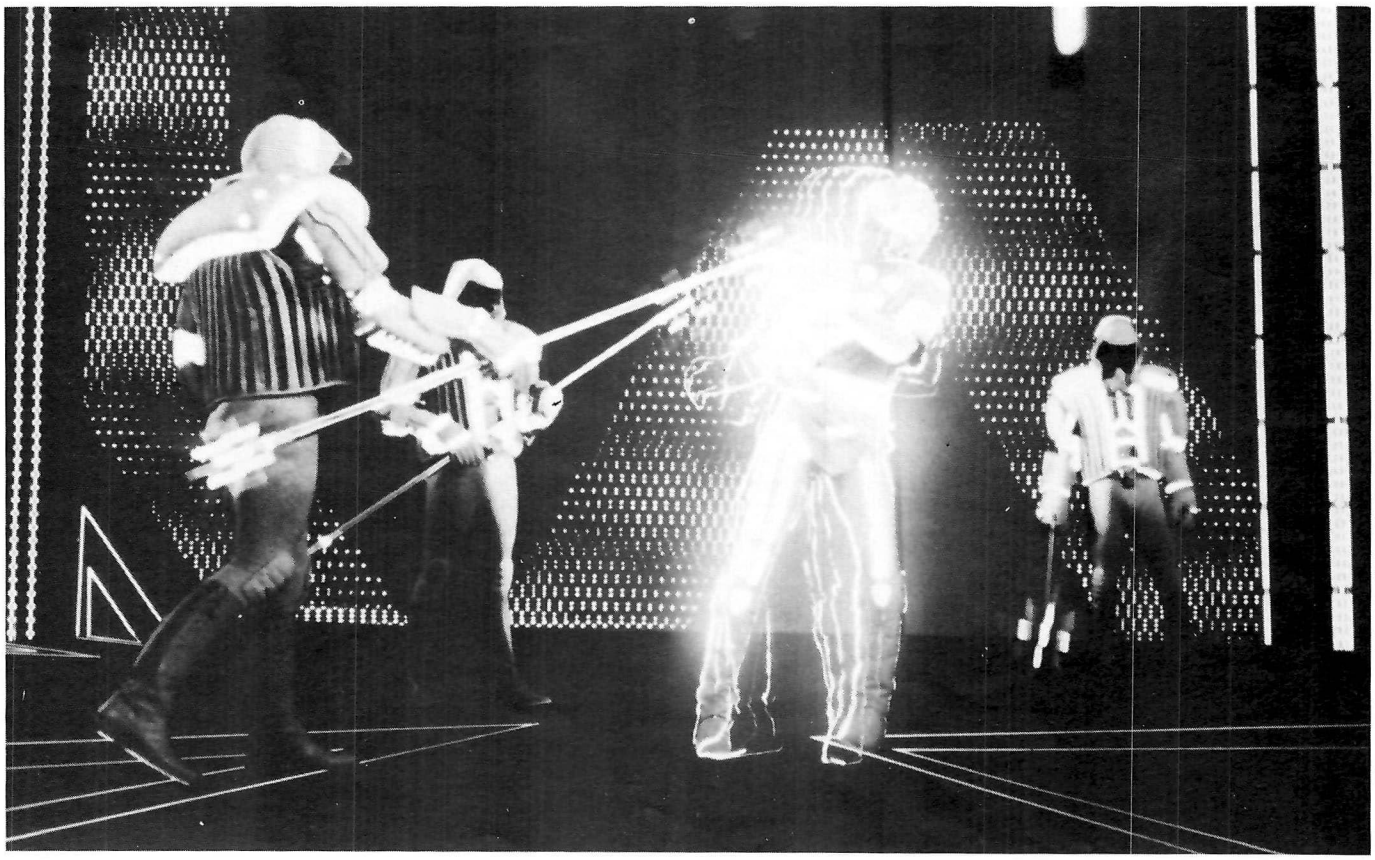
NEW VOYAGER





Above, Flynn at the controls of a video game tank, the exterior of which is pure computer simulation. Below, Flynn is attacked by video game guards moments after entering the electronic fantasy world of TRON. The film was directed and written by Stephen Lisberger whom we will be interviewing in our next issue. All photos: Copyright © 1982 Walt Disney Productions.

would spend his mornings.

MAGI was the only problem in the sense that they were in New York. We solved that problem by having a computer read-out plugged into the telephone. One of our production assistants would come in every morning generally at 5:45 or 6.00 am, and the first thing he would do was to go to where the terminal was, pick up the 'phone and plug it in.

By the time Bill Courrier and Jerry Reese, the two choreographers, the animators who laid out the graphic shot, would come in about three hours later, a whole scene had been transmitted. It would take only that long!

This really worked out very well. They would see what we call 'pencil tests'. Now, admittedly, a computer does not do a 'line test' or a 'pencil test', but for lack of a better term, we called it that. What it was was a low resolution shot. They would come in, take a look at it, and pick up the phone and say 'We want to change this, or that', then MAGI would do it. Very rarely did they even send a second pencil test.

MAGI was so efficient that it was incredible. They would take a look at the shot that Bill or Jerry had laid out and diagrammed, and do it just right. They hit it almost 85% or 90% of the time! We changed very few things. They were really quite amazing!

V: *How was it decided as to which company would do which work?*

HE: That was really pretty simple, because there aren't many companies with the capability that we needed. So it boiled down really to TRIPLE-I and MAGI. Then, we did what we thought was logical. We took the film as a hunk, and we told TRIPLE-I and MAGI to each start on opposite ends of the film, and work to the middle. A bit like the Transcontinental Railway. That way, hopefully, everything would be covered, we thought. And it worked out fine.

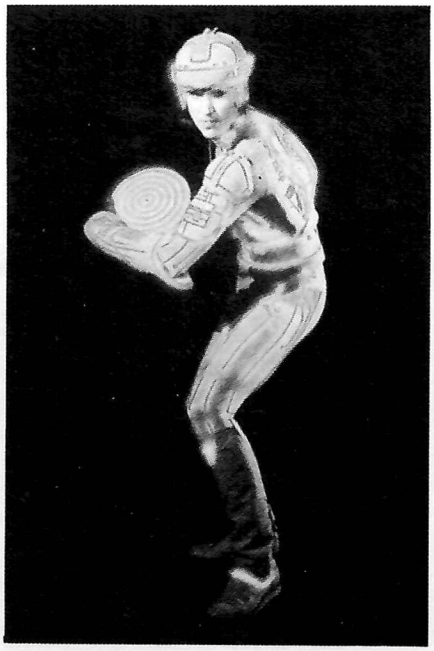
MAGI got a big start. They started on the front end, and did the light cycles first. They got those done quite early. They were really going like crazy. I guess it was like the trains going across the plains – to stick with my analogy – they didn't have any Rocky Mountains to go through.

TRIPLE-I was slower getting started. Once they got started, they got going pretty well too. They also had to provide a number of backgrounds for the backlighting, which MAGI didn't have to worry about. Then, pretty soon, they picked up and they met pretty much in the middle.

In fact, the computer companies were the first ones done. They had their stuff in before we finished the backlighting. Somebody could have bet me a lot of money that theirs would be the last thing to go in the film, and yet they were the first. They really did a phenomenal job.

V: *Did they have the same data to punch in?*

HE: The only place where they overlapped was for the recognizers. Both MAGI and TRIPLE-I did recognizers, and also a little bit of the Sea of Simulation. The rest was all separate, except that MAGI did small carriers way off in the distance. That was nice, that was the way the story worked out, so you could give people different ends of the thing and they wouldn't have to be calling each other up all the time and saying, 'Which colour are you making it?'



V: *Why were outside designers such as Mead or Moebius called in?*

HE: They're ideally suited to the film, I think. They're also the best. I'm not taking away from anybody else, either here or anywhere else in the world, but I worked with Ralph McQuarrie on *The Empire Strikes Back,* and Ralph is considered an excellent illustrator. All that he could say when you asked who he thought was a good illustrator was 'Syd Mead is the best!'

That's high praise indeed. Then, I had always noticed Syd's work and I noticed it more and more. Steven had obviously done the same thing. And this is to Steven's credit that he went after Syd, and got him to do the designs. The same with Moebius . . .

Many people said, 'Well, he's in the Pyrenees, he doesn't have a 'phone and he doesn't want to know anything about films.' Well, he'd done some work on *Alien* so he was approachable. He was very enthused and he came over for four weeks to do designs and concepts.

Then, there was Peter Lloyd, and his reputation is equally good.

So those were three great choices. What could be better then than to have three very, very good designers on a picture, where you don't have the problem of compromise that you do on normal films? You don't have to build a lot of these sets. You can literally take the drawings and say, 'OK, this is what we're going to use.' Then, you draw it out.

Peter Lloyd even designed the backgrounds which were, again, the result of a logical step. We had started to do it without them, and then it was kind of tough. It wasn't working quite well. Finally, Steven said, 'We're crazy! We can get this guy to do background designs! He's very prolific.'

You know, you get what you pay for. Designers seem initially expensive, because they charge a lot of money for a short period of time, but in that short period, they do the work of ten other guys! And better than the ten guys that you would spend the money on. They also do it right the first time.

I believe *TRON* really reflects all three of them very much. You take a Syd Mead with a Peter Lloyd rendition and a dash of Steven Lisberger and there it is. You haven't gone through a draftsman, an art director, a production designer, etc.

There's nothing wrong with designers, but they haven't had to take a '2×4' (a piece of wood used for set building), pound it and paint it. At each point all along is the potential for having the original concepts changed or altered. That did not happen with *TRON.*

V: *You mean, there weren't too many changes from the original designs submitted?*

HE: Frankly, no. This film was set with, I would say, 90% of its look a year before its completion. After, it was all filmed as such in black and white.

For the other 10%, Steven came in and changed a few things, some colours, but nothing really radical. We had a pretty good idea what everything looked like.

V: *Did you personally have any input in the designs?*

HE: No, I didn't have much input at all. My job of supervising the visual effects involved more of a creative selection. I'll be conceited enough to say that there is creativity in selection; like I'd say, 'Syd has two designs here, and we'll use this one because it looks better, or will work better' . . . It's tough work, you know! (Laughter).

There were some times when things literally wouldn't work at all, and then it would be up to us to find a solution. Sometimes, it wasn't really clear-cut, and we didn't always have the ideal solution for one reason or other, but we had to find a way to make it work nevertheless.

V: *Were there times when something was called for in the script and there was no feasible way it could be done?*

HE: Well, originally, the Byte was intended to be, once it was introduced, with Flynn for the rest of the film. But we couldn't do it because of the time factors involved. Obviously, the technology is there, you see the Byte . . . That becomes very frustrating because it's not a matter of art, or a matter of not being able to do it, but a matter of not having the time to do it! That, I would say, in all cases, was the biggest problem. A matter of time!

The grid bugs, which look like they are computer generated are, in fact, hand animation. We were lucky to get those two in there. We wanted more. There was a nice little story point that goes on about grid bugs, but there was just no time.

Continued on page 70

CINEMA

In Revenge of the Jedi, Luke Skywalker, Han Solo, Princess Leia, Lando Calrissian and Chewbacca fight for their lives on the desert wastelands of Tatooine. The enormous 80 foot high, 212 foot long, sail barge and its satellite skiffs, depicted here by technical illustrator Ralph McQuarrie, were built in a remote desert location a dozen miles west of Yuma, Arizona. Photo: Copyright © 1982 Lucasfilm, Ltd.

CHRISTMAS ROUND-UP

ALAN McKENZIE, EDITOR OF STARBURST MAGAZINE, LOOKS AT SOME CURRENT AND FORTHCOMING RELEASES

It's truly surprising just how little in the way of fantasy films is on release over the Christmas period. By the time you read this, *TRON* will have been on release for a little while, but if you still haven't seen the movie then it is well worth the visit. *TRON* is far from perfect, story-wise, but the visuals are of such consistently high quality that they almost carry the film by themselves. However, I won't dwell on *TRON* as I will be covering it in Issue 3 in my interview with director Stephen Lisberger, one of the more personable Hollywood directors, hacks like me get to meet! No, I have bigger fish to fry in the shape of Steven Spielberg's block-busting *E.T.*

To report that *E.T.* is anything short of a masterpiece is to invite the wrath of those who have found the film to be akin to a religious experience. But who cares? I'll take the bull by the horns and say it. *E.T.* is *not* a masterpiece. What it is is an extremely competent and sensitive film about the dreams of every nine year old, past and present. The film appeals to the nine year old that each of us was. Think back . . . unless you were a particularly unimaginative child, you probably fantasised about having a friend (like E.T.) who could do fabulous things and get you accepted by your peers. (In my case it was The Incredible Hulk!) And it is this attraction that has made *E.T.* a hit with just about every man, woman and child in the United States. Already the film has done phenomenal business in Britain as a pirate video. And hopefully, if the bubble has not burst, it will do tremendous trade at the Christmas cinema box office.

As an aside to this, the American fantasy magazines are already printing letters from some of their more imaginative readers who seem to see religious allegory in every frame of *E.T.* One letter, printed in *Fantastic Films,* had me on the edge of hysteria with its preposterous assumptions about E.T.'s divinity. One of the more ludicrous examples of this wasted effort claimed that Elliott's release of the frogs in the school lab paralleled Christ's setting free of the sacrificial animals in the temple, a tenuous connection if ever there was one. Spielberg himself has said (obviously the writer doesn't read *Starburst!*) that the incident of the frogs was taken from his own memories of his school days. Apparently, Spielberg hated dissection and was always tempted to release the animals from their cages, but never did. Therefore, the scene with Elliott and the frogs means nothing more than that Spielberg has a desire to re-write his own history. Nothing religious about that. Just human nature.

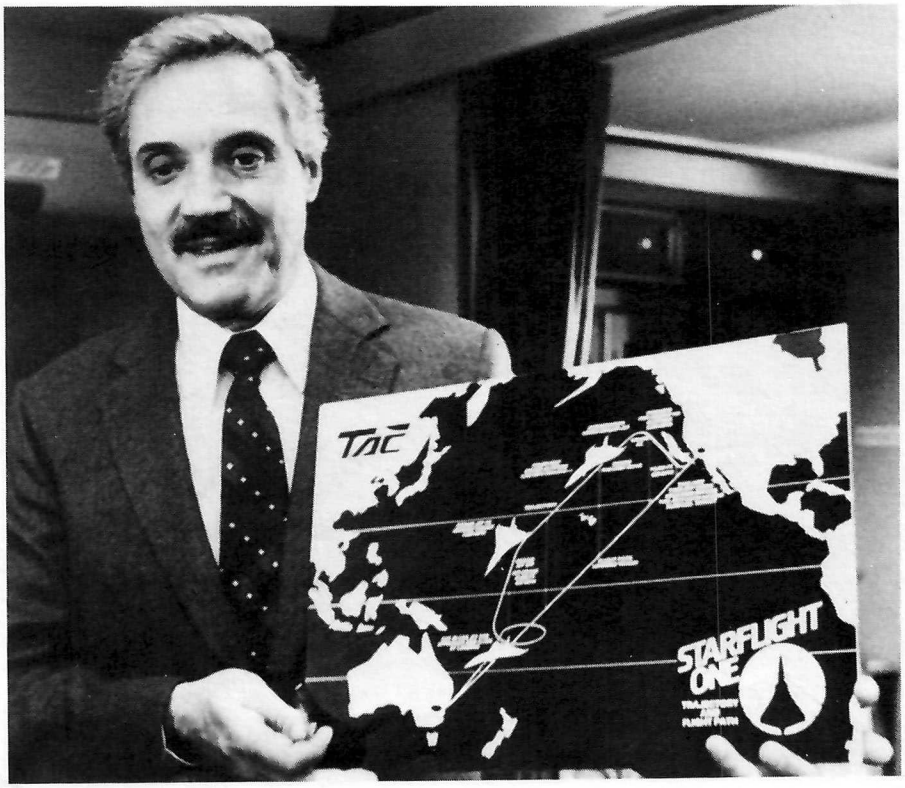
But as *E.T.* is heavily covered elsewhere in this issue, I don't really want to get into a long-winded analysis of the film. Rather, let me forge ahead and talk about *Revenge of the Jedi.* We've all heard the speculation that the three principals of the previous two movies, Luke Skywalker, Princess Leia and Han Solo, are to be killed off in this one. That's old news. However, there are many other unsubstantiated rumours circulating about what happens in *Revenge of the Jedi* which you may not have heard. For example, one source insists that there will be a lot more Yoda-types in *Revenge.* That is, dozens of lovable little E.T.-like creatures which, George Lucas is gambling, will bring a tear to our collective eye. I'm not so sure about that one. But then, the rumoured budget of $50 million would put such a sequence well within the film-makers' grasp. I've also heard that the riddle of Luke/Vader/Luke's father will be solved once and for all. Well, they've had three years to come up with something . . . it should be good. Boba Fett is also supposed to have a much larger role in this film. This is, in part, substantiated by the fact that George Lucas is too shrewd a film-maker to ever cast a Royal Shakespeare actor in such a role if he didn't plan to use him a lot more later. A more reliable source has it that Lucas is finished with *Star Wars* films for the time being. This would come as no great surprise to any of us. After all, we weren't really taken in by the announcement that *Star Wars* was planned as a series of movies rather than as a successful one-off. What? You were? Oh dear. Surely the huge differences in style between *Star Wars* and its successor tipped you off. The shaky way in which the plot threads of *Star Wars* were gathered together for *Empire* must have been something of a giveaway. I've no doubt that Lucas considered all the peripheral details of *Star Wars* (like the Clone Wars) in order to give his first space film a more believable background. But I doubt whether he ever dreamed that he would be called upon, by popular demand, to explore such ideas on celluloid.

Harrison Ford's next assignment after Blade Runner, is the second Indiana Jones epic. Photo: Copyright © 1982. The Ladd Company.

And no, these aren't the demented ravings of an unhinged film writer. More than one Hollywood director has voiced to me similar views during interviews (off the record, of course!), some of them very close to the Lucas camp. But enough on *Revenge of the Jedi.* What about *'Raiders of the Lost Something II'?* Little is known of this project. Those associated with the film are referring to it as *'Indy II'.* But we know *that* won't be the final title. A red-hot contender is *'Raiders of the Forbidden City',* although I wouldn't bet a week's wages on it. That snippet came from the distributors,

Above, 'Jen' and 'Kirsa' mounted securely on 'landstriders', a scene from Dark Crystal, an ambitious project with the entire cast made up of Muppet-type characters. What with these, the rumoured new Yoda-like stars of 'Jedi' and, currently, E.T., who needs actors *these days? Photo: Copyright © 1982. Henson Associates Inc.*

Below, a TAC director explains the flightplan for 'Starflight One', the world's first hypersonic transport aircraft. Starflight One is a new TV/Cinema production scheduled for distribution in 1983. In our next issue we'll be bringing exclusive details in a special interview with SFX wizard John Dykstra. Photo: Copyright © 1982. Filmways Pictures, Inc.



Paramount, and may not be accurate. What we do know is that Spielberg is set to direct, Harrison Ford is to star (no Marion Ravenwood, this time!), and the story takes place a couple of years before *Lost Ark.* There is also a rumour that George Miller (of *Mad Max* fame) will be holding the reins of the second unit team. Based on that, it's a sure bet that there will be extensive stunt work in the film, probably involving motor vehicles, both two and four wheeled. More than that I daren't say, except to note that portions of the film are scheduled to be shot on mainland China. Filming is due to start in January.

Still no sign of *Dark Crystal* on anybody's release schedules. The film, in which no human actors appear, is heavily populated by yet more Yoda-style muppets – hardly surprising as the man behind the project is none other than Jim Henson, creator of Kermit and all those other loveable characters. So why the delay in release? Surely they must be getting nervous as *Revenge of the Jedi* draws ever closer? I have been told that Henson bought the film back, lock, stock and Muppet, from distributors **ITC** for a cool $40 million. How reliable that figure is, I couldn't say. However, I know that the film is still being tinkered with as I write this and that early sneak previews in America were met with a negative response. With Henson as sole owner of the picture there would be every likelihood that if he wasn't satisfied with the end result he would just shelve it. *If* Henson is the sole owner!

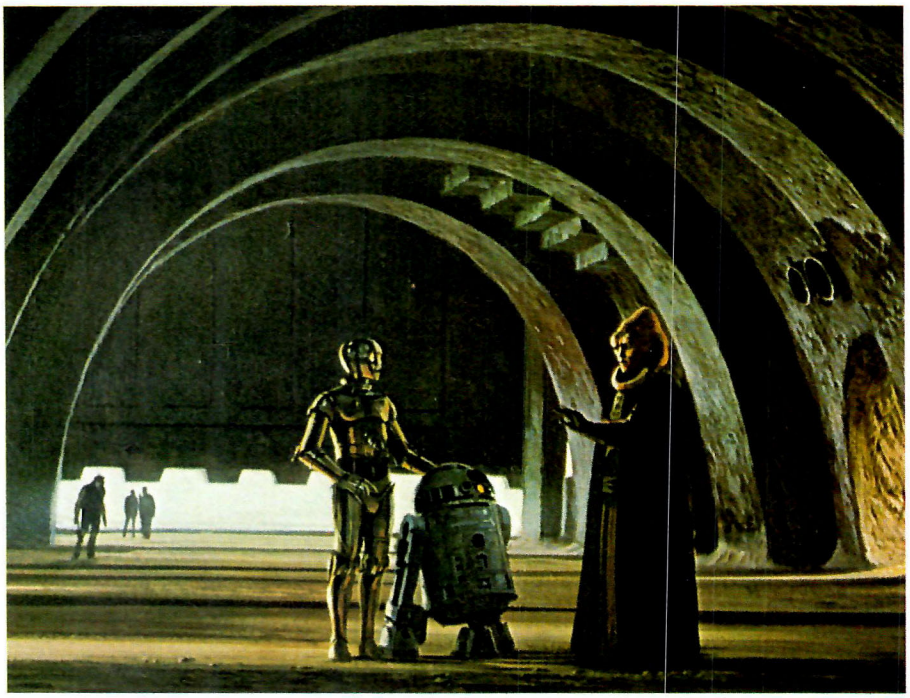
And finally, for this column . . . the latest project of the Alexander Salkind team looks like being *Supergirl.* Pre-production has already commenced with Timothy (*Pirates of Penzance*) Burrill as producer and Jeannot Schwarc, who helmed *Jaws II* and *Somewhere in Time,* slated to direct. No Supergirl has been announced yet, though it's likely that Christopher Reeve will make an appearance in the film. Shooting on that has been scheduled for February and it sounds like an interesting project. I wonder how they'll keep it from looking like another of the *Superman* series? See you next time . . . *

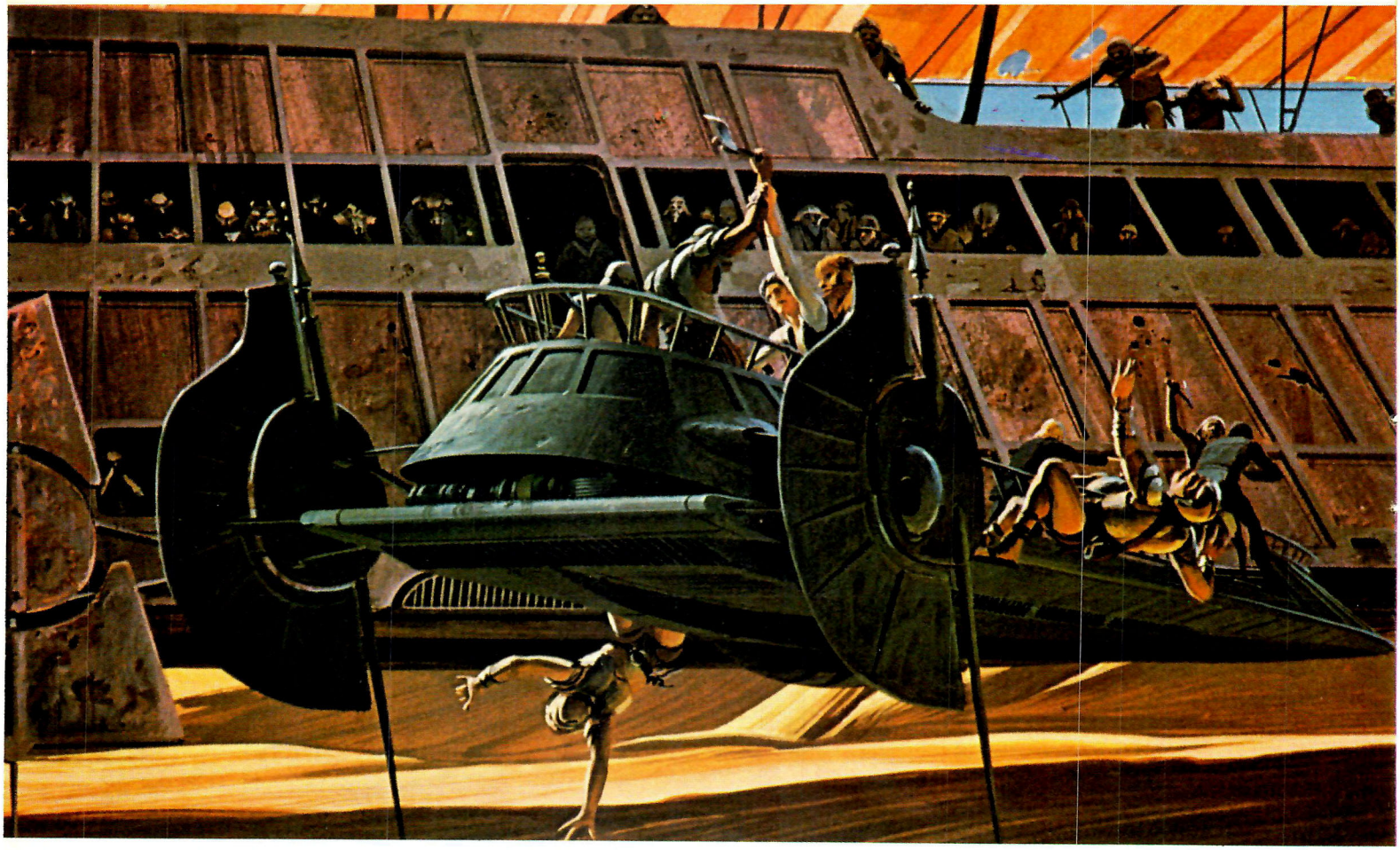
Right, a massive metal door filters out the blinding Tatooine sunlight, closing off their only escape route, as C-3PO and R2-D2 are intercepted in the entrance hall to Jabba the Hutt's desert palace by his sinister major domo Bib Fortuna.

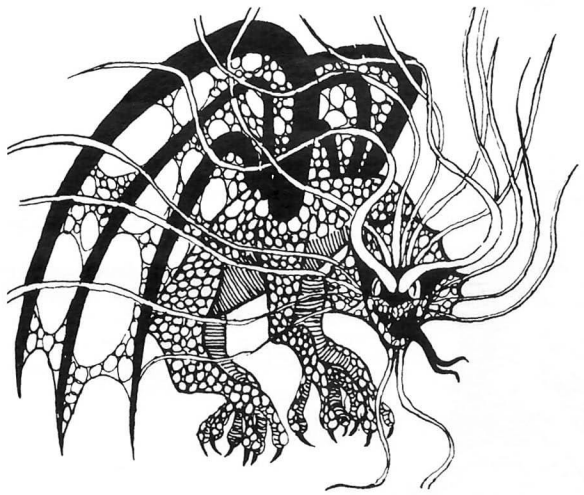
Below, the third of Ralph McQuarrie's exciting pre-production paintings for Jedi shows Luke, Han, Lando, Chewbacca and the Princess in the battle for survival over Tatooine, introduced in the original Star Wars film.

Revenge of the Jedi is being produced by Howard Kazanjian and directed by Richard Marquand from a screenplay by Lawrence Kasdan and George Lucas. US and UK premiere date has been set for May 27.

Photos: Copyright © 1982 Lucasfilm, Ltd.







At The Sign Of The Dragon

These are just a few of the goodies we sell. If you are in London we are two minutes' walk from Mortlake Station. (SR) Anywhere else in the world send a large S.A.E. for catalogue. Back numbers and subscriptions are available for B7 and Dr Who Monthly, Starburst, Starlog, Fangoria, Fantastic Films, cinefex, S.I.G., etc. We now take ACCESS, and still take Book Tokens. Post Prices quoted below are for British Isles only. Overseas post is higher.

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Richard and Marion van der Voort.

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READ OUT

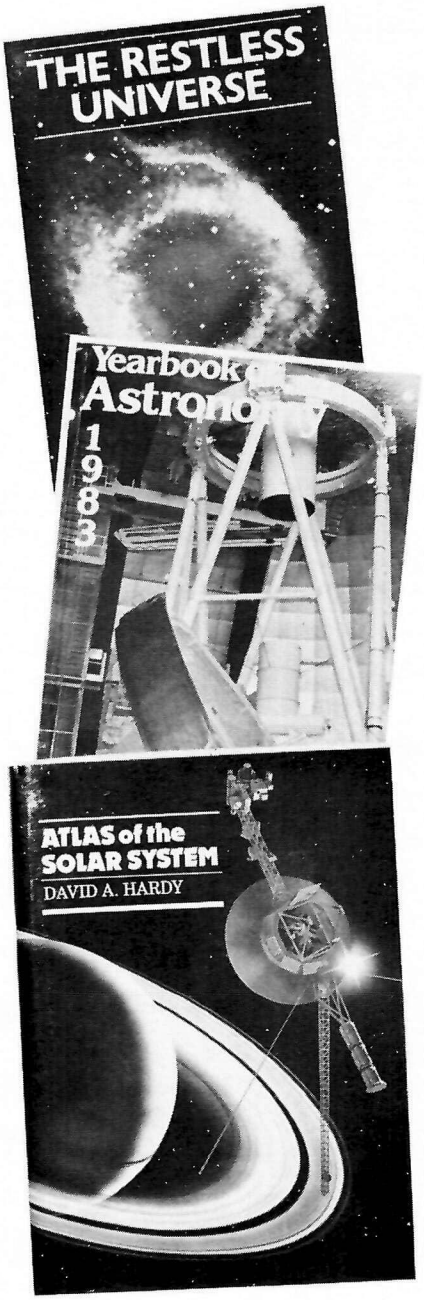
ASTRONOMY

'The Atlas of the Solar System' by David A Hardy. Published by World's Work, Ltd., at £12.50. Hard covers.

One of *VOYAGER*'s resident artists, David Hardy, has provided many an astronomical painting to many a publication. This culminated in the large-format Mitchell Beazley book that David did with Patrick Moore, *The Challenge of the Stars,* published in 1972, and the up-dated *New Challenge of the Stars* that appeared in 1977. For these two books, David naturally supplied the artwork whilst Patrick dealt with the text. However, David also started writing himself, and was thus in the unique position of being able to illustrate his own books exactly how he wished. This was demonstrated with smaller format books such as *Air and Weather, Energy and the Future* and *Light and Sight,* although he did collaborate with Bob Shaw and produced *Thomas Cook's Galactic Tours* that appeared in 1981 and reviewed in *Space VOYAGER.* Now comes *The Atlas* and this has to be one of the most beautifully illustrated books of its type. Of course, most of these are in the form of Hardy artwork, although he hasn't ignored the stunning pictures sent back from the probes – especially Viking and Voyager. Consequently, the reader has both the actual photographs for reference and paintings of aspects of the planets that the camera lens did not capture. Jupiter can be represented not only by the magnificent Voyager photographs, but artwork of the surface of Io and the Volcanoes actually in action.

There are still aspects of the Solar System where the artist rules supreme – areas where the camera has not yet penetrated. The premier edition of *VOYAGER* showed visions of the surface of Venus that have only been glimpsed at by the Venera Landers. One of the illustrations was, in fact, from this book. The outer planets, past Saturn, also fall into this category and will until 1986 when, if all goes well, Voyager 2 makes a close approach to the next giant planet, Uranus. Meanwhile, David gives us his versions (based very firmly on current scientific knowledge), plus a touch of calculated intuition of views that Voyager might just relay back to Earth.

Besides straightforward illustrations, David puts his talents to good use when it comes to explanations. This book is, after all, designed for information, as well as being satisfying to ponder over. The dawn of creation and the development of the solar system, which are the beginning chapters, use the paintings as descriptive diagrams and David must put as much effort into the simplest explanatory drawing as into some of his full-scale paintings. More full-colour drawings and diagrams explain such mysteries as the Earth's magnetosphere (the various charged particles that spread out many times the Earth's diameter); the structure of Earth itself, and man's changing explorations of the Universe around him. Being a factual book, the future is resticted to a couple of intriguing views of Mars, the second of which shows the outcome of Man's potentially greatest practical effect on a terrestrial-type planet or satellite – that of 'terraforming' – converting the surface and atmosphere into a livable environment for the human race. The book is of large format, even larger than *Challenge of the Stars,* and although priced at £12.50., it isn't all that expensive, and it's gratifying to read that it was printed in this country! **MI**



'The Restless Universe' by Nigel Henbest and Heather Couper. Published by George Philip at £8.95. Hard covers.

There have been times when books on astronomy could have been termed, 'a little dry and dusty'. Not today, though, when excellent colour photographs can be used in conjunction with the latest theories and discoveries that all go to prove the Professor Haldane statement that Arthur Clarke is fond of quoting, 'the Universe is not only stranger than we imagine – it's stranger than we CAN imagine.' Such is the case with the latest co-operation of *New Scientist*'s Nigel Henbest and the Royal Greenwich Observatory's Heather Couper who, of course, has also written for this issue. *The Restless Universe* draws on all the current thinkings on the past, present and future Universe, written authoritatively, but what is even more important, written in a way that makes the whole subject interesting even for the casual and initially-uninformed reader. In fact, one could even say it's written like a good novel, in that once started it's a hell of a job to put it down! And considering this is a non-fiction book, that's no mean feat. The language helps. Everyday happenings are linked to counterparts on a cosmic scale, such as in the chapter on the Milky Way. The galaxy formation is likened to stirring cream into your coffee and an intriguing discovery reveals that there is enough ethy alcohol in one gaseous cloud in the Galaxy to fill Earth with whiskey! In another chapter on the Birth of the Solar System, the formation of the planets is 'somewhat akin to a stock-car race', and in The Secret Life of Stars, some are believed to 'wobble about like cosmic blancmanges!' – you get the general idea. This light-hearted approach in no way detracts from the more fundamental basis of the book, that being to thoroughly explain our present understanding of the Universe. **MI**

'The 1983 Yearbook of Astronomy.' Edited by Patrick Moore. Published by Sidgwick & Jackson at £4.95. Soft covers.

The standard astronomy handbook, invaluable for the amateur enthusiast and layman alike. Edited by Patrick Moore, this handy-sized book is packed with information on what happens during the year as well as providing a section of relevent articles.

Complete star charts occupy the first section of the book, showing the star patterns overhead at any time of the year corrected to 52°N, *ie,* the British Isles and all similar latitudes, and also for 35°S: Australia, New Zealand and South Africa. The phases of the Moon are listed as a table, as well as the positions of the planets. Then each month is taken in turn, which are the sections of, probably, the most interest to the casual observer. They list and detail all the astronomical features visible that month, particularly which planets are best placed for viewing. In addition, some of the constellations with the more interesting objects are looked at in greater detail. The eclipses of the Sun and Moon are also listed in their appropriate months and Patrick makes no apology for repeating his usual warning. Do NOT look at the Sun direct, by any means; observe only by indirect viewing such as projection.

Short sections at the end of the months deal with other astronomical objects, such as the Minor Planets or Asteroids, Comets and Meteor showers. The article section is written by such well-known names in astronomy as

David Allen, who deals with photographing the universe at its extreme limits, and Jacqueline Mitton who takes a lateral look at man's efforts in measuring the Earth-Sun distance throughout history as recorded on postage stamps.

Other articles look at the Giotto Mission to Halley's Comet and a fascinating little article by Philip J Stooke giving, for the first time that I'd seen, maps of Mars' tiny satellites Phobos and Deimos.

In all, the *1983 Yearbook of Astronomy* is a vital part of the collection of anyone even remotely interested in the subject. **MI**

'The Eagle has Wings.' Compiled by Andrew Wilson. Published by the BIS at £7.00. (Post free). Soft covers. From 27-29, South Lambeth Road, London SW8 1SZ.

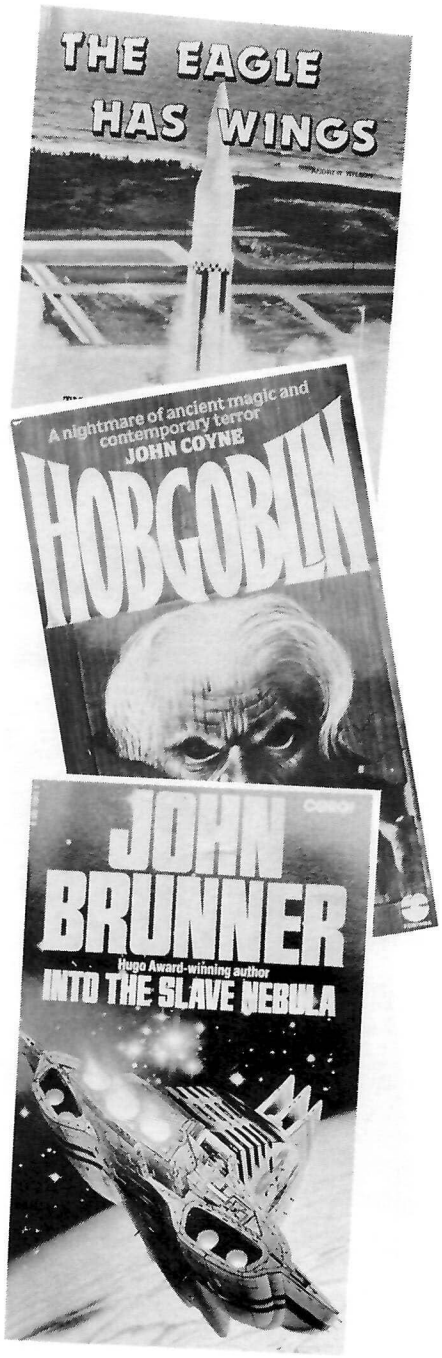
The British Interplanetary Society is not a publisher as such although they do produce the general interest magazine *Spaceflight,* the more specialised *Journal,* and the new *Space Education.* However, they have branched out into large-format paperbacks dealing with specific aspects of astronautics. The first was the report on Project Daedalus, a feature of which appeared in our pilot issue, *Space VOYAGER.* Secondly came *High Road to the Moon,* mainly as a tribute to the artist Ralph A Smith (usually known just as R A Smith) who died in 1959, but had produced seemingly hundreds of paintings, drawings and sketches on all aspects of astronautics. Third, and most recent, comes *The Eagle has Wings,* the story of American Space Exploration from 1945 to 1975. It has been compiled by Andrew Wilson, who is also Managing Editor of *Spaceflight,* although other members of the Society have had a hand in various stages of the book's development.

It is a very full history, starting just after the Second World War and the early experiments with captured V-2 rockets, ranging through the early launchers; Vanguard, Jupiter C and probes; Pioneer, Ranger, Mariner and Surveyor and the Manned flights; Mercury, Gemini and up to Apollo, Skylab and Apollo-*Soyuz.* Finally, a look at the planetary exploration of Mariners 9 and 10 and Pioneers 10 and 11.

The book is well illustrated, though unfortunately only in black and white, with the only colour being on the cover. However, this is but a minor criticism; the book makes up for this in its pure thoroughness of the subject's treatment and should become a standard reference work. **MI**

'Earthwatch' by Charles Sheffield. Published by Sidgwick & Jackson at £10.00. Hard covers.

This is a book of views of Earth from Space or, more accurately, various Landsat satellites, and only the overworked words 'fascinating' and 'amazing' are suitable as description. The colour photographs, portraying various parts of the Earth at a scale of anything from five to nine miles an inch, literally show us a new world. The text is just enough to be interesting, without detracting from the pictures. If one ordinary picture is worth a thousand words, this book is probably worth the contents of the average library. **MV**



SCIENCE FICTION

'Bladerunner Sketchbook'. Published by Blue Dolphin Enterprises at around £4.25. Soft covers.

This is only available from specialist shops in Britain and gives a clear picture of the thinking behind the film and the efforts made to show a believable future. Who looks at parking meters, bicycles, buses and notices? They are part of the background, but the shot of an anachronistic artifact could so easily break the spell in an urban environment. Most film makers opt out of the dilemma by showing desert worlds, underground caverns or the odd nightclub with funny shaped glasses. *Blade Runner* is probably the first serious film since *Metropolis* to shape a future city; to show it for real, dirty, busy, crowded in some parts, empty in others. The artwork of Syd Mead, Mentor Huebner, Ridley Scott, Charles Knode and Michael Kaplan shows just how many little details had to be considered. **MV**

'The Cursed Earth' Parts 1 & 2, 'Judge Caligula' Parts 1 & 2, 'Robo Hunter' Parts 1 & 2. All published by Titan Distributors, Ltd., at £3.50. each. Soft covers.

Judge Dredd brought me back to comics, after years of mourning for Dan Dare. Now **Titan** have brought out various reprints, large-sized, in black and white with a coloured cover. For those unfortunates who have never come across *2000AD,* the scene is the Earth of the future, after the atomic holocaust. Much of the planet consists of devastation, inhabited by a few mutants, and the remnant of mankind is penned up in a few Mega-Cities in gigantic blocks of flats with almost universal unemployment and a horrific crime rate. Only the Judges, trained almost from birth, keep civilisation going, and Judge Dredd is the biggest and toughest of them all. In *The Cursed Earth,* Judge Dredd rides out on his trusty motorcycle to take a badly-needed vaccine from Mega-City 1 to Mega-City 2. *Judge Caligula* tells the story of a crooked Judge's attempt to take over the city. *Robo Hunter* is about a human detective in a world of robots. Parents tend to dislike all of these, which should be sufficient recommendation for the rest of us. **MV**

'Reincarnation' by Ian Wilson. Published by Penguin at £2.50. Soft covers.

This is an investigation into various claims to prove reincarnation, including *The Bloxham Tapes* and *Encounters With the Past.* In a scholarly way Ian Wilson disagrees here, correlates two theories there, and finally comes to a conclusion – that there is *nothing* conclusive. It is worth reading for his ability to tear down a case without resorting to a claim to superior knowledge or personal abuse. **MV**

'Two To Conquer' by Marion Zimmer Bradley. Published by Arrow at £1.95. Soft covers.

Yet another *Darkover* book, again portraying conflict between the sexes as well as between kingdoms. Not quite up to her usual standards, perhaps, but very readable. If you have never dabbled in *Darkover* history don't start with this one, as it would be very confusing to a newcomer. **MV**

'Wired' By Harry Hellerstein. Published by Severn House at £6.95. Hard covers.

For some reason billed as 'Computer Science Fiction', this publication reminded me of the earlier Kornbluth books. As the cover says, 'in the grand tradition'; it is basically Sword and Sorcery updated to cover duel by computer. I enjoyed it, in spite of the four-letter words scattered throughout. **MV**

'Pawn Of Prophecy' by David Eddings. Published by Futura at £1.25. Soft covers.

I sighed at the ominous 'Book 1' on the cover. Somehow it seems impossible to get a single

READ OUT

book published at the moment, and few publishers are willing to go to the expense of putting out all the books together. So you are left waiting for the ending, but I was soon deep in the funny, yet moving, story of a young boy's growth to adulthood under the stern thumb of a Sorcerer's daughter. Yes, I will grab the next instalment as soon as it appears. MV

'The Time Of The Dark' by Barbara Hanbly. Published by Futura at £1.25. Soft covers.
Yet another in the Sword and Sorcery series, of yet another land where Evil is overcoming Good. Yet another pair of humans find themselves in a strange land that soon becomes home. But admitting all that, I still liked it. It has a couple of slightly new twists, and at least it doesn't claim to be an epic. MV

'Hobgoblin' by John Coyne. Published by Fontana at £1.75. Soft covers.
This is the fourth book from John Coyne and although it's a bit slow getting off the ground, it picks up pace and becomes quite gripping about halfway through.

The book centres on two main characters and is set in the United States. Barbara Gardiner is suddenly widowed and is forced, through lack of funds, to resume work as an art historian at the only place she can find – Ballycastle, a large, grotesque, Gothic castle shipped over from Ireland in the 1920s, and open to the public since its owner's demise.

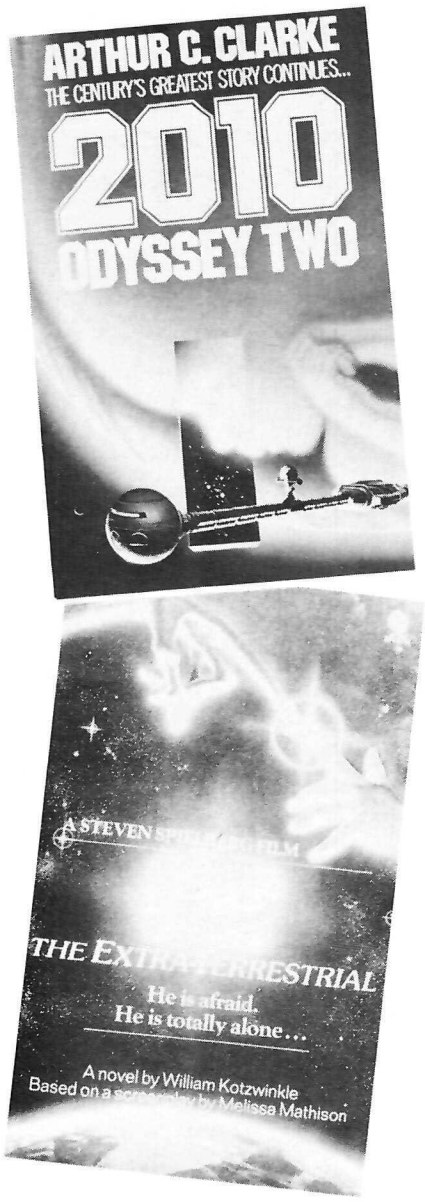
Her son, Scott, has to leave his preparatory school, where he has enjoyed being the best player of Hobgoblin (a FRP game based on Irish mythology) and attend Flat Rock High School. Scott finds himself ostracised by his peers and frequently plunges into a world of make-believe where he imagines himself to be his own fantasy figure – Brian Boru.

Working at Ballycastle, Barbara discovers that ten young Irish maids died mysteriously half a century before, and further investigations prove that the castle's Irish owner was a depraved sexual pervert. Strange things begin to happen, culminating in something akin to a small scale massacre at a school Hallowe' en dance held at the castle. Can Scott, in the guise of Brian Boru, triumph over evil and win the admiration of his classmates after all? NJ

'The Wrath Of Khan Photostory' Published by Methuen at £1.25. Soft covers.
A black and white(!) reproduction of a superb film. I did like the way that the dialogue was printed at the side, instead of trying to get it all in those absurd balloons, and they did a pretty good job in picking all the important stills, but how many colour blind fans are there around? (NB. Even the US edition is not in colour.) MV

'Into The Slave Nebula' by John Brunner. Published by Corgi at £1.50. Soft covers.
This book, by the Hugo Award-winning author of *Stand on Zanzibar,* begins on Earth, an Earth whose people prosper and do nothing but seek pleasure since all needs are met by automation in the form of androids and robots.

At the start of the annual carnival week, Derry Horn happens across the mutilated bodies of a man and an android. Both these tragedies seem futile to Derry (brutal murders are a thing of the long distant past), especially



when he learns the identity of the dead man – Lars Talibrand – 'a citizen of the galaxy', one whose life had been dedicated to helping others.

Appalled at what he has discovered, Derry sets off on a journey retracing the steps of the dead man to try and find out what he had learnt that was so important as to make his death necessary.

Derry has only just begun his perilous mission to the outlying stars when he finds himself in jeopardy and, having risked his life several times, begins to piece together the sequence of events that had led Talibrand to his death. To reveal these would obviously spoil the enjoyment of the book for any potential reader but, as you can no doubt surmise from the title, interplanetary slave-trading may have something to do with it!

Needless to say, our hero manages to survive some very sticky moments, although he is curiously absent from the bloodthirsty battle at the climax. However, he does *almost* set the galaxy to rights before walking off into the starlight with Talibrand's beautiful widow!

I found this adventure easy to read, racy and quite entertaining, if somewhat predictable. NJ

'E.T. The Extra-Terrestrial' by William Kotzwinkle. Published by Sphere at £1.50. Soft covers.
Based on Melissa Mathison's stirring screenplay, the *E.T.* novelisation has been handled by one of America's top writers. Kotzwinkle has given the character of E.T. great charm, his descriptive passages of the little creature's thoughts and fears carrying much humour. The reader will receive an overall impression that the author really enjoyed writing the story; an impression that is reflected in the light-hearted style that prevails in a book which has become a top seller in the UK. Copies have been vanishing off the shelves almost as rapidly as the premier issue of *VOYAGER!*

Fans of the film will dip into the novel again and again to help them recall favourite scenes and, perhaps, try to imagine how some that 'missed' the camera lens would have looked on screen. One of the best film tie-in books I've read for some time and Sphere also produce a condensed version, full of colour stills, for £1.95, which should prove popular with younger readers. RLR

'2010 – Odyssey Two' by Arthur C Clarke. Published by Granada at £7.95. Hard covers.
Trying to follow *2001 – A Space Odyssey* must have been difficult and, as our interview with Arthur C Clarke reveals, it took him 14 years to get around to it! The obvious question is going to be, 'does it solve the mysteries of the first book', and, to a certain extent, it could be said that it does whilst also bringing in many new ones of its own. Without giving away the plot, the book is set in typical 'Clarkeian' style with many short chapters, invariably jumping from one aspect of the overall story to another, a couple even taking the form of 'Internal Memos'. It isn't giving away too much by stating that most of the action takes place aboard the Soviet ship *Alexei Leonov* which has been sent to Jupiter to the still-orbiting *Discovery* in an attempt to find out just what happened. Three Americans are also on board, or to be more precise, two Americans and an Indian, Professor Chandrasegarampillai, the inventor – if that is the correct word – of HAL. One of the other Americans aboard will also be familiar to us, Heywood Floyd.

Those familiar with both the original film and book, which were written simultaneously, will know that both Arthur C Clarke and Stanley Kubrick went their separate ways when dealing with individual aspects of the two written versions. Overall, it didn't affect the outcome, but one rather major change was that in the film the *Discovery*'s destination was Jupiter,

whilst Arthur took them one planet further to Saturn. Further, that mysterious monolith of the film is in orbit around Jupiter, whilst the book has it planted on the Saturnian moon Iapetus.

For conventionality, *2010* sets the action as it follows the film, so the new ship sets course for Jupiter. The monolith is still in orbit around the giant planet, and is now named Tycho Magnetic Abnormality – 2, although one of the Soviet crew points out that it is not magnetic and that it is billions of miles from the crater Tycho. When *2001* was written and made, our knowledge of Jupiter was scant indeed; in fact man hadn't even approached the Moon, let alone landed. It wasn't until Pioneer 10 and 11 and, more particularly, Voyager 1 and 2, that we began to know anything like the surprises in store. Arthur has skilfully incorporated the information Voyager sent back, especially with regard to the Jovian satellites, although to say more will spoil the saga for potential readers.

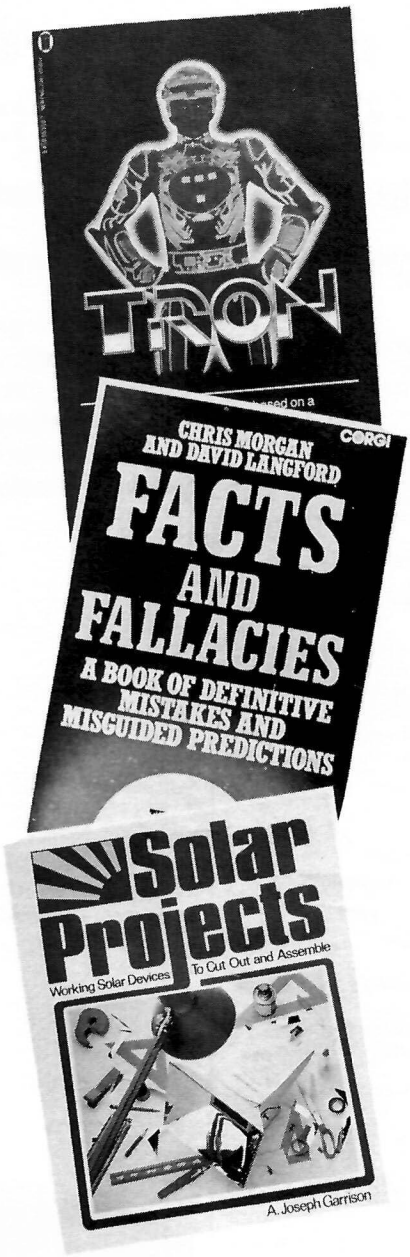
The book is extremely readable and I doubt if anyone, once they've started it, will be able to put it down until they've finished. It's interesting also to spot the little touches Arthur is fond of. For example, there are two *Star Trek* references and one *Star Wars,* in addition he refers sideways to one of his own stories, *A Meeting with Medusa.* So the saga continues and *2010 – Odyssey Two* will stretch the mind and imagination just as much as *2001 – A Space Odyssey.* **MI**

'The Science Fiction and Fantasy Film Handbook' by Allan Frank. Published by Batsford, Ltd., at £9.95. Hard covers.

A sorely-needed up-to-date encyclopaedia of several hundred SF and fantasy films as diverse as *Mary Poppins* and *Alien.* It is a veritable goldmine of useful information, carries over 200 stills and is well written and obviously the result of painstaking research. Each film, they're arranged alphabetically rather than chronologically, is provided with a complete list of credits, cast list, a plot synopsis and quotations from contemporary film reviewers, warts and all. It is the latter that I found most absorbing. In retrospect it is fascinating to read some of those quotes. On *Alien;* . . . 'a horrid film, skilful and studied in its nastiness' . . . On *CE3K;* 'The human factor in Spielberg's screenplay is, well, boring. The basic difficulty is that there isn't any conflict . . .' On *The Man From Planet X;* . . . 'one of the most excruciating bores ever to emerge from the pinpoint on this planet known as Hollywood . . .

Frank's book is rich with gems such as these.

Destined to become a well-thumbed reference in the *VOYAGER* library, this new handbook can be firmly recommended. And lest parents of young SF fans pour scorn on modern cinema offerings, how about the great classics of yesteryear? Ask them about *Devil Girl from Mars, Attack of The Killer Tomatoes, Shirley Thompson versus The Aliens* and *Son of Blob . . .* **RLR**



'TRON' by Brian Daley. Published by NEL at £1.50. Soft covers.

Novelisations of films are almost mandatory and *TRON,* by Brian Daley, is better than some. If you didn't understand the film, what there was to understand, the novel explains some of it, but with a feature like *TRON* that relies so much on visual imagery, the novel is somewhat flat. A section of colour stills is included in the middle of the book. **MI**

GENERAL INTEREST

'Solar Projects' by A Joseph Garrison. Published by Columbus Books at £8.95. Soft covers.

Published in America by **Running Press** of Philadelphia, Pennsylvania, Mr. Garrison's book could be termed a true practical reference on solar power. When you've read all about it, you can tear out 75% of the pages and cut them up to make actual working solar projects. Just take a look at what can be made out of this one publication: sun angle viewer, equatorial sundial, bowstring equatorial sundial, cross sundial, model solar house, solar oven, solar food dehydrator, parabolic solar furnace, and a 'sunflower' portable reflector. The projects are clearly printed on good quality heavy stock paper together with fully comprehensive instructions.

One of the most amazing items in the book can be found on page 41. The solar oven really *can* heat sandwiches according to the text and providing the instructions are followed exactly. I regret to say that having to review this publication in Winter means that, so far, the various projects are yet to undergo exhaustive tests. Until the weather is more favourable we'll reserve judgement but in the meantime, readers can learn more about the Sun itself by turning to the second part of Iain Nicolson's article featured elsewhere in this issue.

Solar Projects is one of the most interesting publications we have seen for a long time and will certainly prove invaluable for science lab school teachers. Recommended. **RLR**

'Facts and Fallacies' by Chris Morgan and David Langford. Published by Corgi at £1.50. Soft covers.

This book is a compilation of definitive mistakes and misguided predictions made by both the famous and the not so famous; a treat for those who revel in other people's gaffes.

There are 24 sections running from the Arts and Astronomy through to Women and Worlds' End. Most appropriate for this magazine would be examples from the Astronomy and Spaceflight categories:

'Whatever the Sun may be, it is certainly not a ball of flaming gas'. *D H Lawrence.*

'The final proof of the whole cosmic ice theory will be obtained when the first landing on the ice-coated Moon takes place.' *Hörbiger Institute Pamphlet, 1953.*

Even our own Patrick Moore published a paper in 1958 discussing the possibility of sending a rocket to photograph the dark side of the moon and said 'To hope for an early success is being highly over-optimistic.'

It actually took less than 14 months, but then hindsight is no respecter of persons . . . An interesting and amusing book for the collectors of useless information. **NJ**

REVIEWERS FOR THIS ISSUE WERE:

MI:	**Mat Irvine**
NJ:	**Nikki Jackson**
RLR:	**Ray Rimell**
MV:	**Marion van der Voort from 'At the Sign of the Dragon'**

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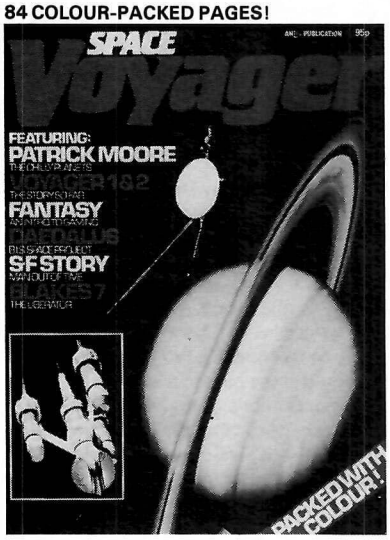

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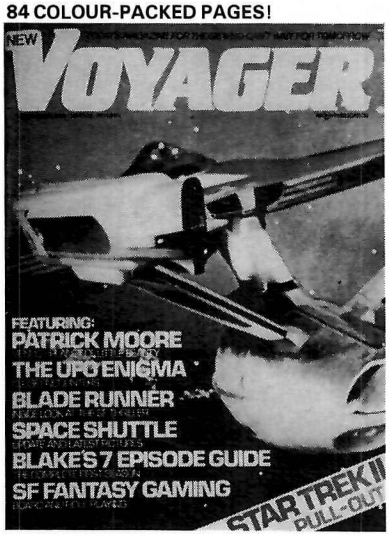

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MAN & SPACE
– THE FIRST 25 YEARS

MAT IRVINE LOOKS BACK ON THE SPACE AGE

If you look hard enough, you can usually find an excuse to celebrate an anniversary in any year. However, 25 years is a good, round figure, especially when it celebrates the launch of the world's first artificial satellite – *Sputnik* 1 on October 4, 1957.

During the early years, noting the 'firsts' is fairly straightforward: the first satellite; the first lunar 'crash' lander; the first lunar soft lander, etc., etc., However, the more up-to-date we get and with the number of satellites launched approaching untrackable numbers, the more 'incidental' firsts you get, and, of course, the increasing number of seconds, thirds, fourths, *ad infinitum.* Usually the satellites that followed did better than their predecessors, but in true 'Book of Records' style, it's the first that really counts.

More up-to-date still, and particularly in the last decade, the satellites and probes that have been launched invariably score a number of records. Many are still doing so. In some ways it's unfair to give the magnificent achievements of missions such as Viking, Voyager, Pioneer, *Venera* and the manned exploits of the Apollo and *Soyuz/Salyut* crews a mere single heading under a single picture, but more detailed descriptions of the missions will be presented in future editions of *VOYAGER.* •

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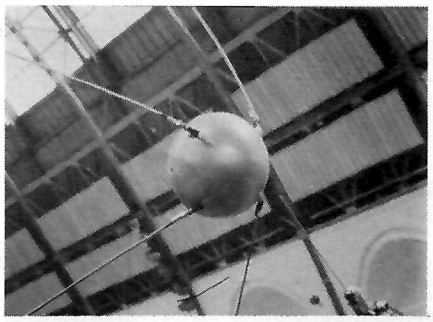

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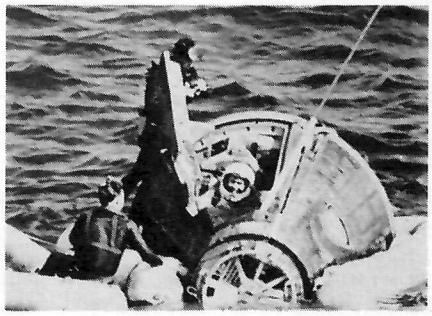

Key.	Craft.	Launch.	Country.	First.
1	*Sputnik* 1	4/10/57	USSR	Artificial satellite.
2	*Sputnik* 2	3/11/57	USSR	Living creature – *Laika,* the dog.
3	Explorer 1	31/1/58	USA	US satellite.
4	*Luna* 2	13/9/59	USSR	Probe to hit the Moon.
5	*Luna* 3	4/10/59	USSR	Probe to photograph the Moon's far side.
6	Echo 1	12/8/60	USA	Passive Comsat.
7	*Vostok* 1	12/4/61	USSR	Man in orbit. Yuri Gagarin.
8	Mercury 3	5/5/61	USA	US sub-orbital hop by Alan Shephard (Mercury Redstone).
9	Mercury 6	20/2/62	USA	US Orbital flight by John Glenn.
10	Ariel 1	26/4/62	GB/USA	International launch.
11	Telstar	10/7/62	USA	Active Comsat.
12	Mariner 2	27/8/62	USA	Venus flyby.
13	*Vostok* 6	16/6/63	USSR	Woman in space. Valentina Tereshkova.
14	Ranger 7	28/7/64	USA	Close-up Moon pictures.
15	*Voshkod* 1	12/4/64	USSR	Three-man crew.
16	Mariner 4	28/11/64	USA	Close-up pictures of Mars.
17	*Voshkod* 2	18/3/65	USSR	Space Walk, Alexi Leonov.
18	Gemini 3	23/3/65	USA	US two-man flight.
19	*Venera* 3	16/11/65	USSR	Probe to hit Venus.
20	Gemini 6 & 7	15/12/65	USA	Manned rendezvous. (Gemini 6 and 7)
21	*Luna* 9	31/1/66	USSR	Moon soft lander.

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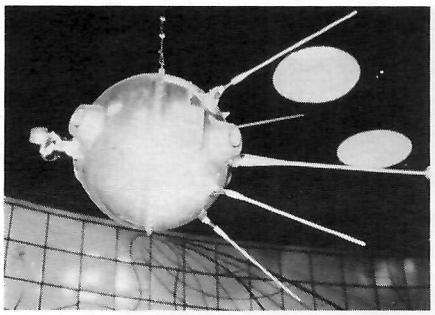

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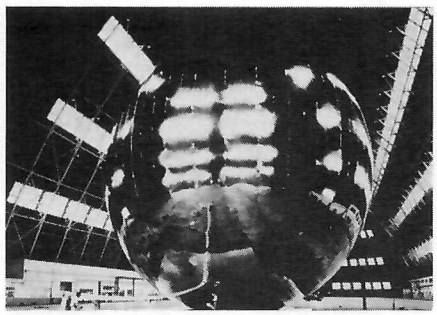

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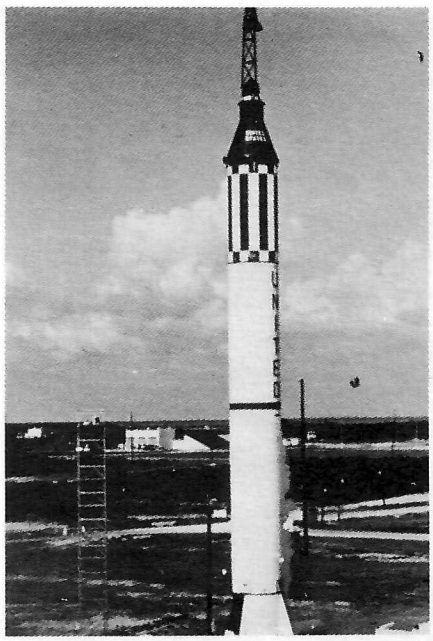

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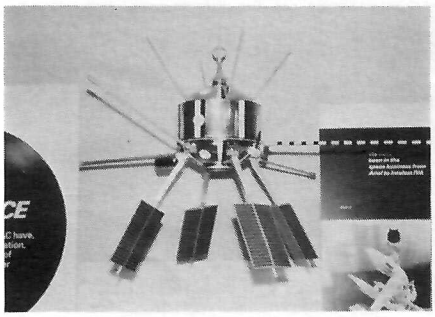

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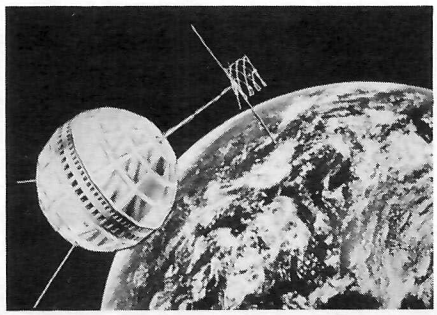

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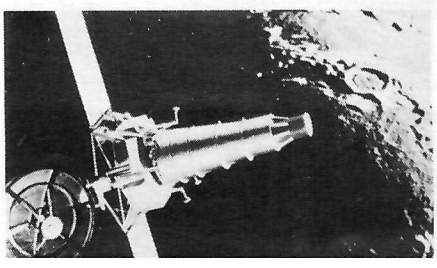

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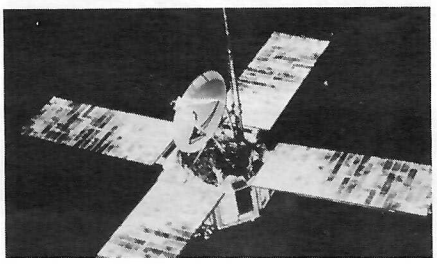

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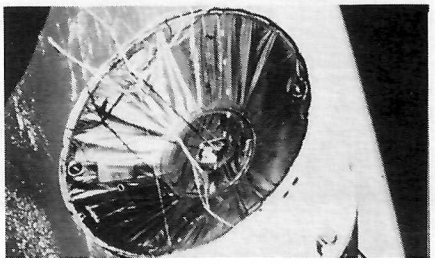

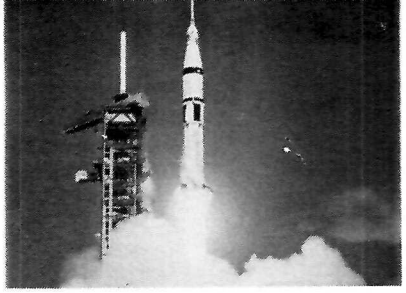

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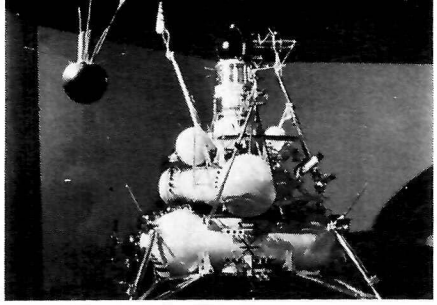

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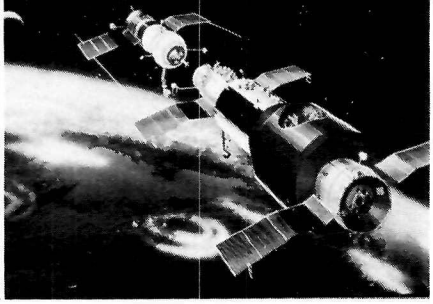

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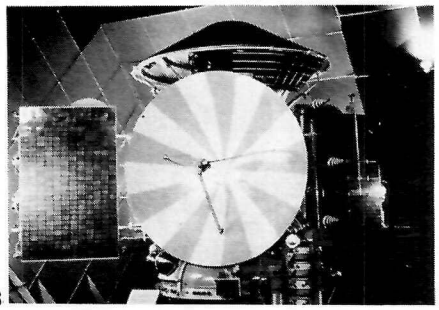

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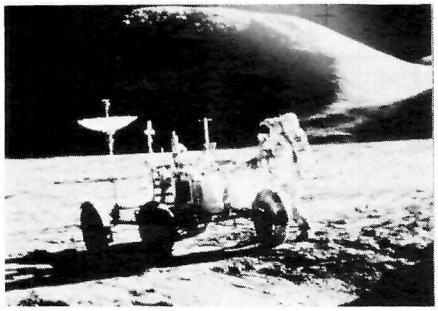

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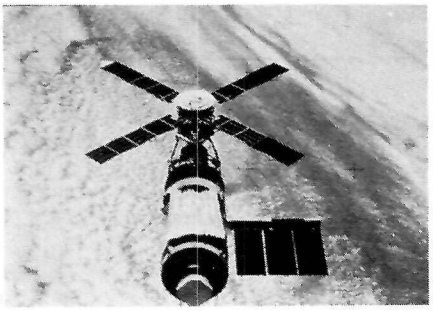

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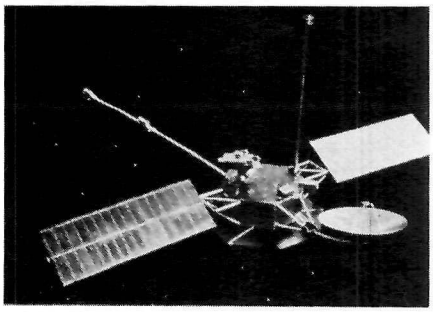
Key.	Craft.	Launch.	Country.	First.
22	*Zond* 5	14/9/68	USSR	Circum-lunar and return.
23	Apollo 7	11/10/68	USA	US 3-man flight. (Saturn 1B).
24	Apollo 8	21/12/68	USA	Manned circum-lunar flight.
25	*Soyuz* 4 & 5	14/1/69	USSR	Transfer between craft.
26	Apollo 11	16/7/69	USA	Manned lunar landing.
27	Apollo 12	14/11/69	USA	Re-encounter with another spaceprobe – Surveyor 3.
28	Apollo 13	11/4/70	USA	Space 'rescue'.
29	*Venera* 7	17/8/70	USSR	Venus soft-lander.
30	*Luna* 16	12/9/70	USSR	Unmanned soil-sample return craft.
31	*Luna* 17/ *Lunokhod* 1	10/11/70	USSR	Vehicle on the Moon. (*Lunokhod*).
32	*Salyut* 1	19/4/71	USSR	Spacestation. (*Salyut & Soyuz*).
33	Mars 2	19/5/71	USSR	Probe to hit Mars.
34	Mariner 9	30/5/71	USA	Mars orbiter.
35	Apollo 15	26/7/71	USA	Manned lunar vehicle.
36	Pioneer 10	2/3/72	USA	Jupiter flyby (3/12/73).
37	Skylab	14/5/73	USA	US space-station.
38	Mariner 10	4/11/73	USA	Two-planet encounter – (Venus 2/2/74, and Mercury 29/3/74)
39	Helios 1	10/12/74	Germany	Sun probe.
40	*Venera* 9	6/6/75	USSR	Venus surface pictures.
41	Apollo/*Soyuz* Test Project	17/7/75	USA/ USSR	International manned space mission.
42	Viking 1	20/8/75	USA	Soft-lander on Mars. (20/7/76).
43	Voyager 1	5/9/77	USA	High-definition Jupiter/ Saturn pictures. (5/3/79 and 12/11/80).
44	Progress 1	20/1/78	USSR	Tanker spacecraft.
45	Pioneer Venus Orbiter	20/5/78	USA	Venus orbiter. (4/12/78).
46	Ariane	24/12/79	Europe	ESA Launch.
47	Space Shuttle STS-1	12/4/81	USA	Reusable spacecraft launch.
48	Space Shuttle STS-2	12/11/81	USA	Launch of a second-hand spaceship.



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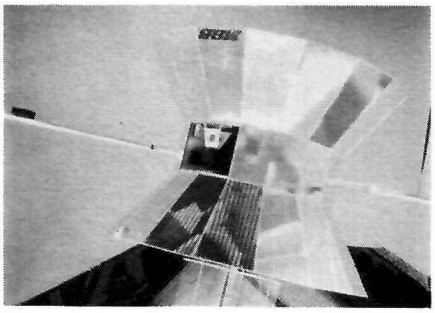

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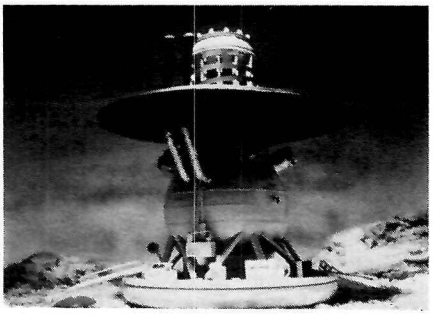

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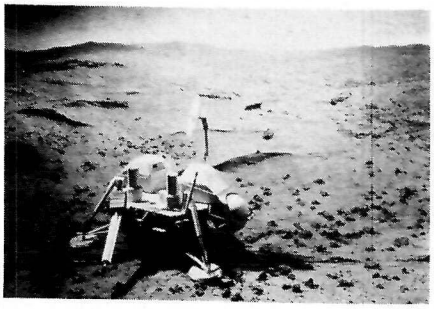

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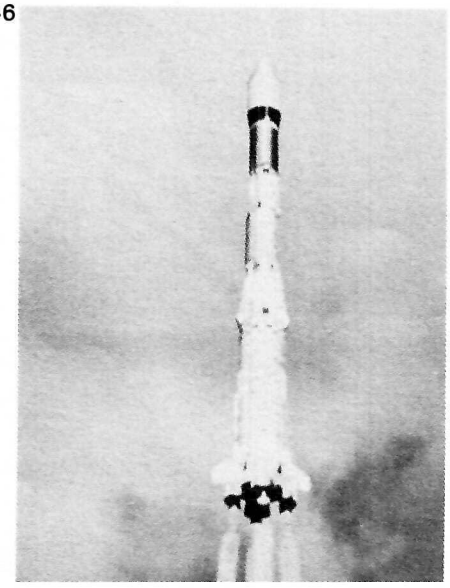

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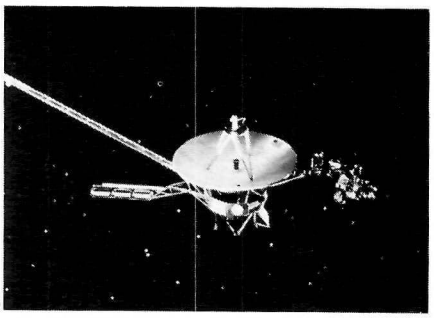

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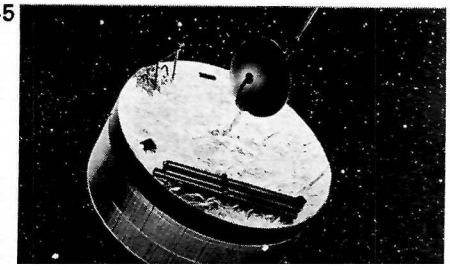

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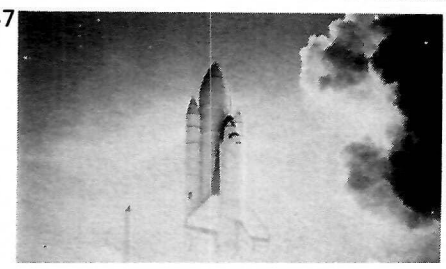

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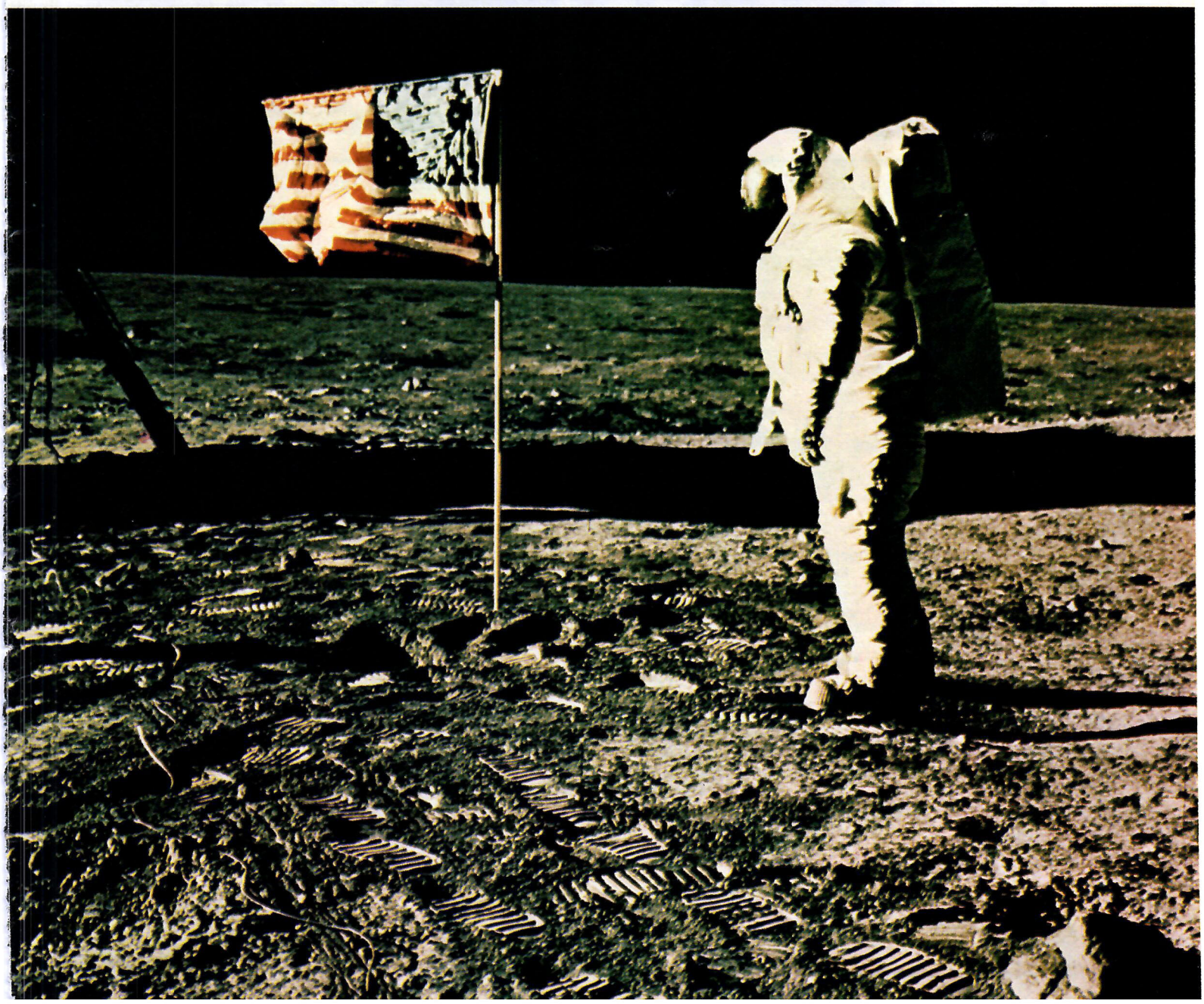
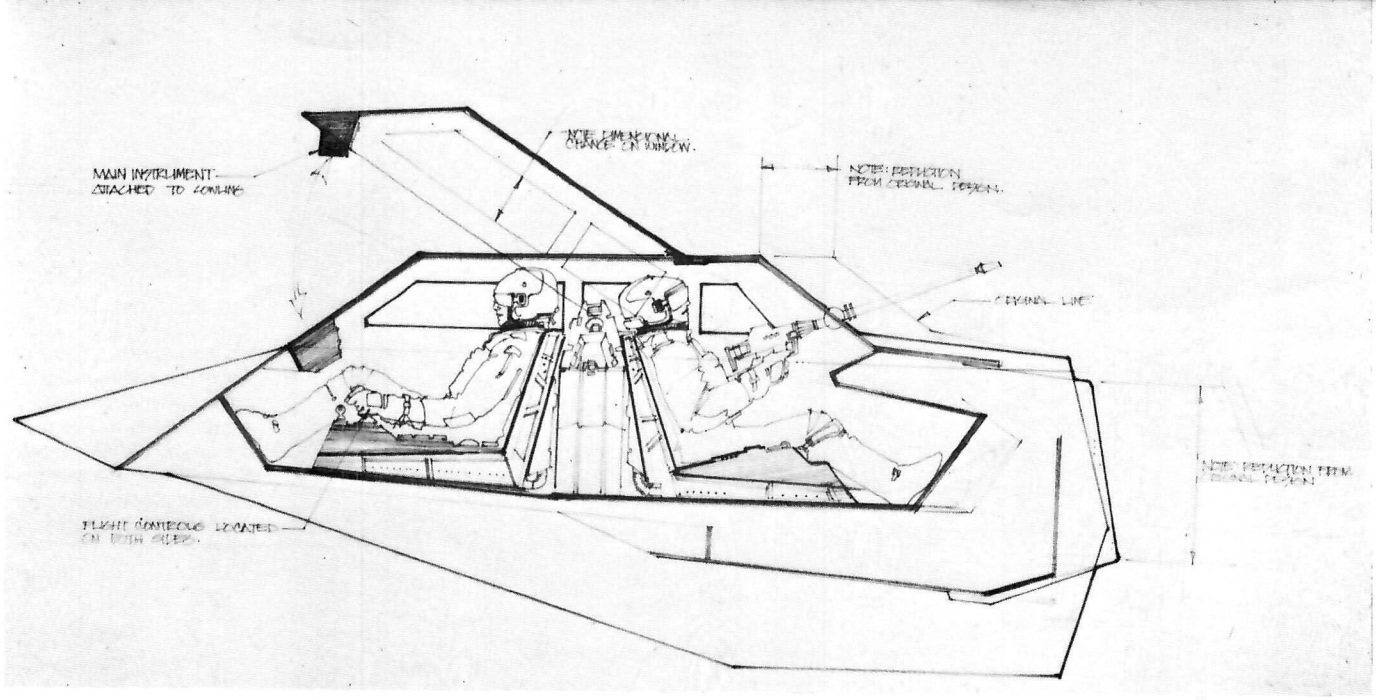
Left, Yuri Gagarin and Vostok I; the first man in orbit on April 4, 1961. Below, one of mankind's giant leaps. Apollo 11, and Buzz Aldrin stands proudly by the American flag following the first manned moon landing on July 16, 1969. Photos: via Mat Irvine.





LUKE SKYWALKER'S SNOWSPEEDER

DIORAMA SETTING AND SUPER-DETAILING HINTS FOR THE AIRFIX KIT
MODEL PROJECT BY RAY RIMELL

KIT: Luke Skywalker's Snowspeeder
MANUFACTURER: Airfix, distributed in UK by Palitoy Limited. (MPC in USA). Kit No. 1-1917.
SCALE: 1/35th (approx.)
DIMENSIONS: Overall length 8", overall width 7¼", overall height 2¾".

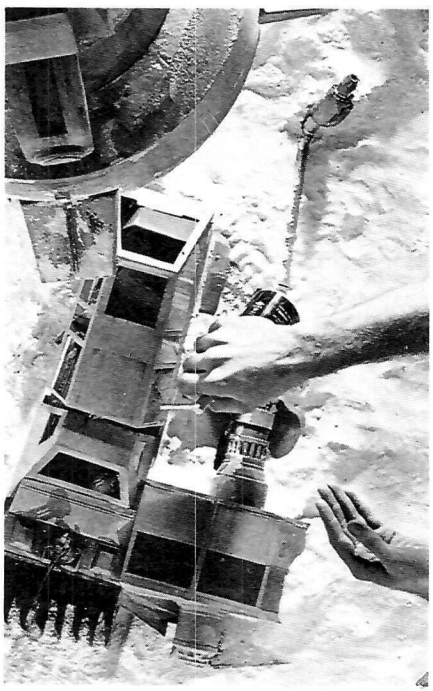
To 'combat' the *AT-AT* (*VOYAGER*'s *Autumn, 1982* issue) **Airfix Products** carry an extremely fine model of Luke Skywalker's *Snowspeeder* in their *Star Wars* kit range. Despite being one of the best SF kits of its type around, the model does have a few faults which are not necessarily simple to correct since available references tend to conflict in areas of detail. Comparison of the full-size *Snowspeeder* mock-ups with the miniature SFX models highlights the differences; study our accompanying pictures to appreciate the point.

As regards overall accuracy, the kit checks out fairly well although there are several major differences in panel detail – especially those adjacent to the two cannons. To the rear of the craft, Airfix have provided an accurate version of the radiator (?) but omitted some central pipe detail in the process. Cockpit detail is unusually comprehensive but the floor is far too shallow and the two crew figures are weak, featuring unlikely postures and non-typical costumes. Other areas require attention but you could really tie yourself up in knots trying to duplicate the original *Snowspeeders* in their various forms. At best, you must settle for compromise.

In building a *Snowspeeder* for this issue I decided that the model warranted a diorama display to really do it justice. I was unhappy with the kit's display stand, and I rather fancied the scene in *Empire* where Luke abandons his stricken *Snowspeeder* just before it is crushed underfoot by an Imperial Walker. So, having gathered together a pile of reference magazines and books, I set to work . . .

Building the model

1. If you decide to follow my suggestions for a simple diorama, you'll need a suitable base to start with. Mine was an offcut of ½" thick chipboard, cut to 12"x12", with the upper surface roughened/scored/scratched with an old knife to act as a key for the 'terrain'. For the latter, I used a commercial filler called **Tetrion** which comes ready-mixed and can be found in DIY stores or FW Woolworths. I found it helpful to 'dry' assemble the model, using masking tape to hold the major parts together, then ploughing it right into the Tetrion while it



Heading, this pre-production sketch of a Rebel Armoured Snowspeeder by Nilo Rodis offers some indication of cockpit layout. Note the depth of the floor which is not featured accurately in the Airfix kit. Above, a Snowspeeder miniature is set up to be crushed by a Walker during filming of the Hoth battle sequence. Photo: Terry Chostner.

set. Removal of the model later on leaves the 'pushed-up' snow fixed in position which allows for easy placing of the completed and painted model. 'Tracks' left by the cannon were made by running the end of an old paintbrush along the Tetrion.

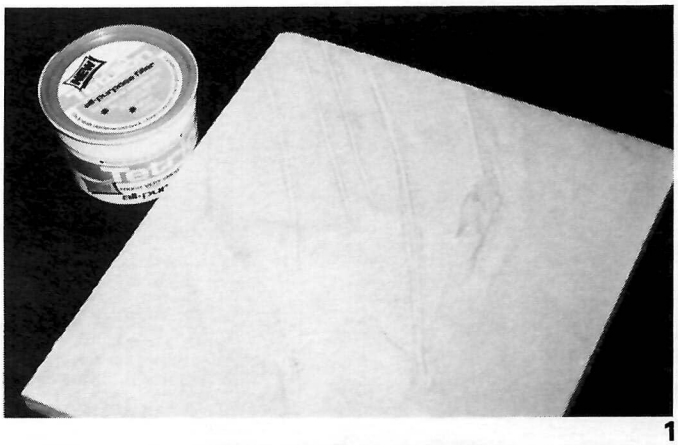
2. We can turn now to interior details. I scrapped the clear plastic cockpit transparencies (*Parts 1CL* and *2CL*), for I considered them far too thick and not particularly clear either. The window apertures themselves are rather poorly defined and I set to it with a knife and file to sharpen up their outlines. Study of Mat Irvine's photos reveals 'diamond' quilt padding on the cabin roof. This can be duplicated by using 0.5 plastic sheet (thin card or cartridge paper would do almost as well) scored with criss-cross lines using an old biro and ruler. The panel is then cut out, trimmed, and attached to the roof with glue or double-sided tape. The panel should be painted a pale fawn colour.

3. If I wished to provide a blow-by-blow account of how to detail the *Snowspeeder* cockpit, it would take up several pages. Suffice to say that after careful study of available photos and details in *The Art of The Empire Strikes Back,* I was able to create a convincing unit. Most of the extra detail work was accomplished with the aid of scrap plastic and odd lengths of plastic tube, strip and soft solder. One major improvement concerns modification of the seats. They should really be lengthened, and one method is to use pieces of plastic rod (used to carry the parts in plastic kits) and filing one edge flat. Several of these rods can be cemented together to increase the cushion area as shown in **Fig.1.** Other fittings can be added as desired and I would, again, refer you to the drawing for a few suggestions.

Instrument panels and faces were cut up from 1/32nd scale WW2 fighter aircraft panels produced by the American firm, **Waldron Products.** This enterprising concern also produces miniature seat buckles for large scale car and aircraft models and lengths of scale oxygen pipe. All these items are ideal for superdetailing SF kits and are distributed in the UK by **Croydon Impex** of Old Coulsdon, Surrey.

4. Laser damage was inflicted on the *Snowspeeder*'s upper hull by drilling and cutting out a large ragged hole. Thin out the edges by careful filing to achieve the effects of torn, wafer thin, metal skinning. Under the hole, cement a section of scrap plastic to represent internal structure. Here, we can only see the underside of the modification, but for a few ideas for internal details I would refer you to **Fig.2.** Note that the rear cockpit has been reglazed with thin clear plastic sheet cemented to the hull sides and then carefully painted over in medium grey up to the window surrounds.

5. The fully completed interior, with all the necessary panels, consoles and control sticks detailed and painted, is cemented to the upper section of the hull.



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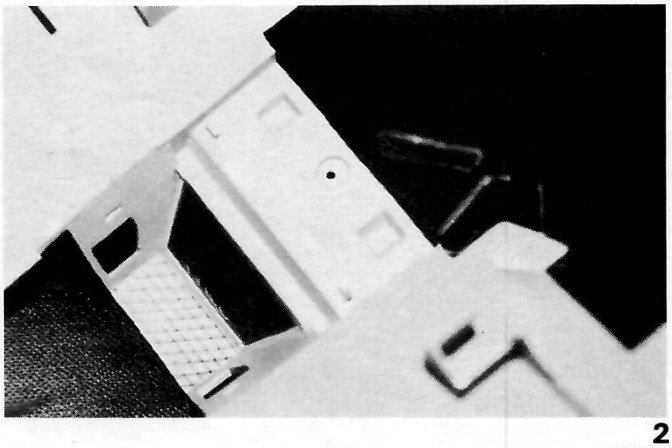

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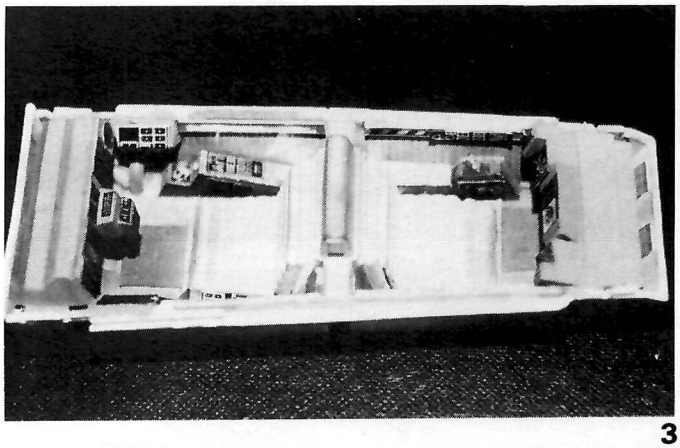

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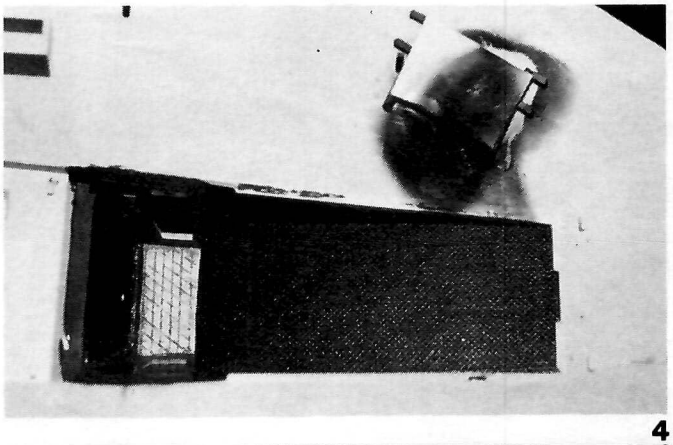

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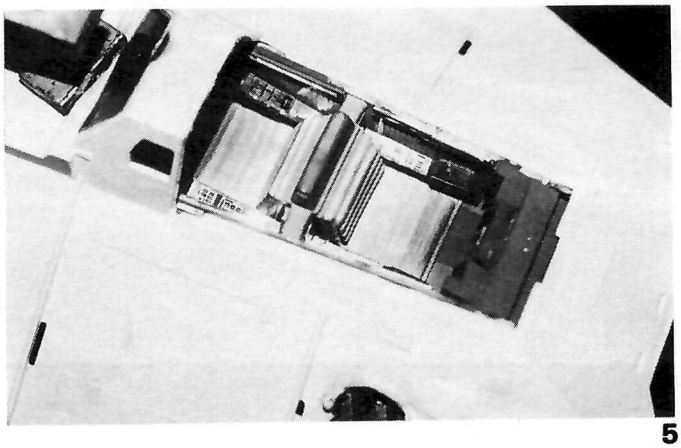

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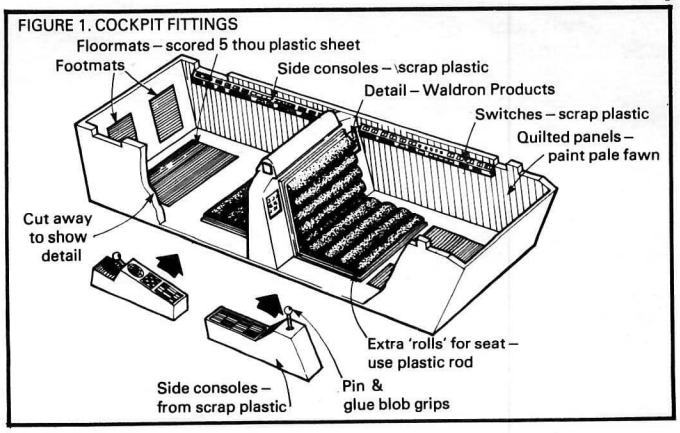
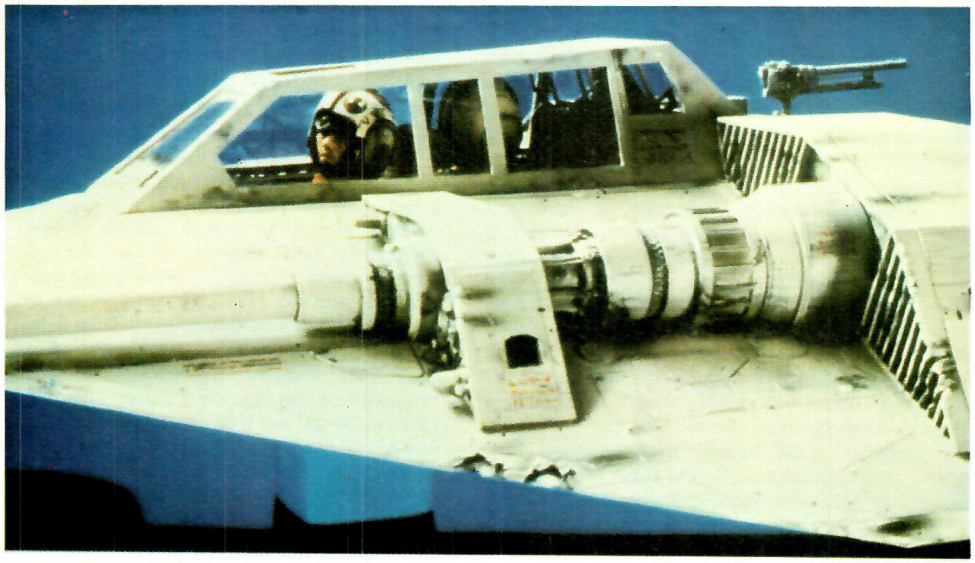
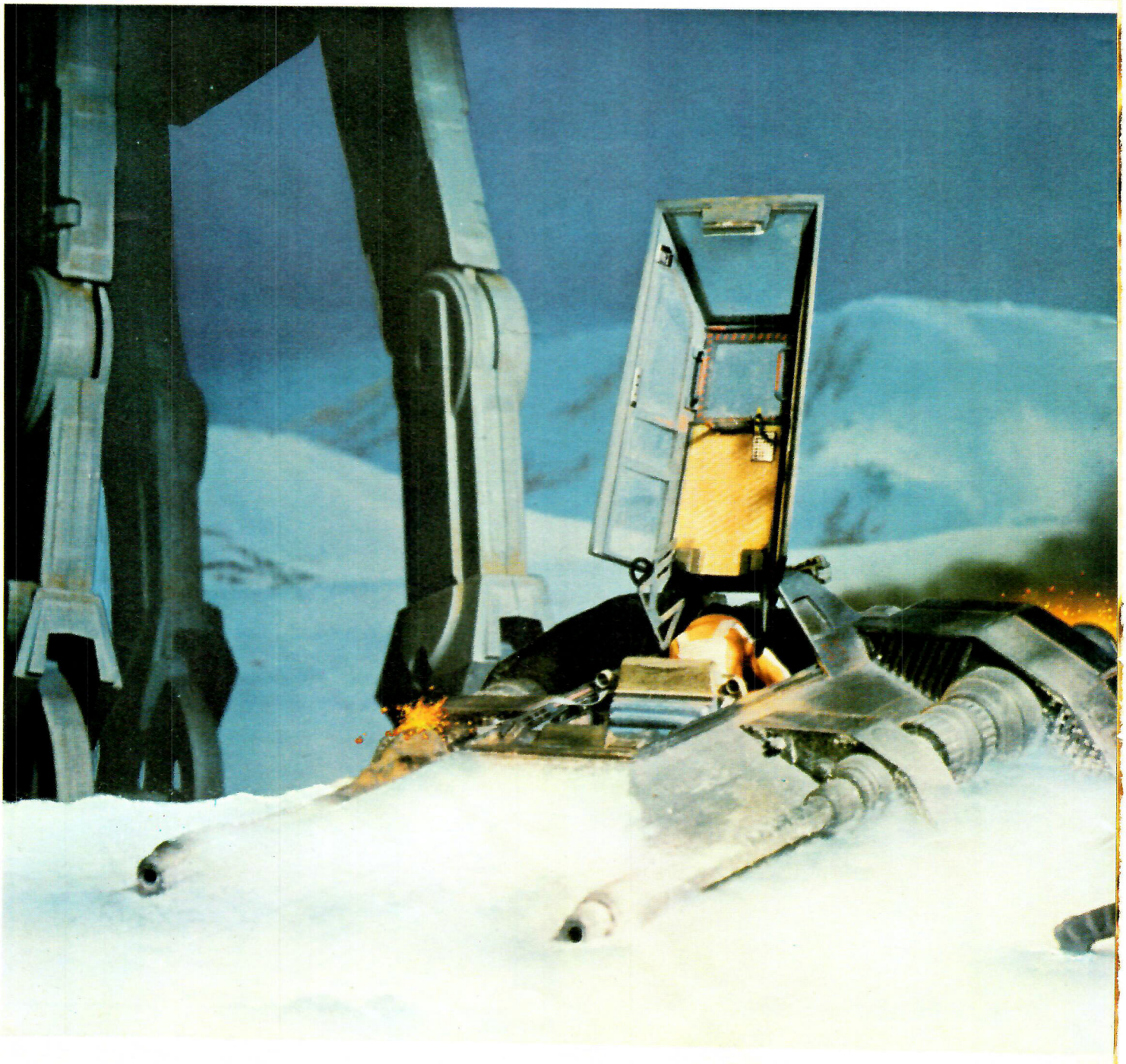
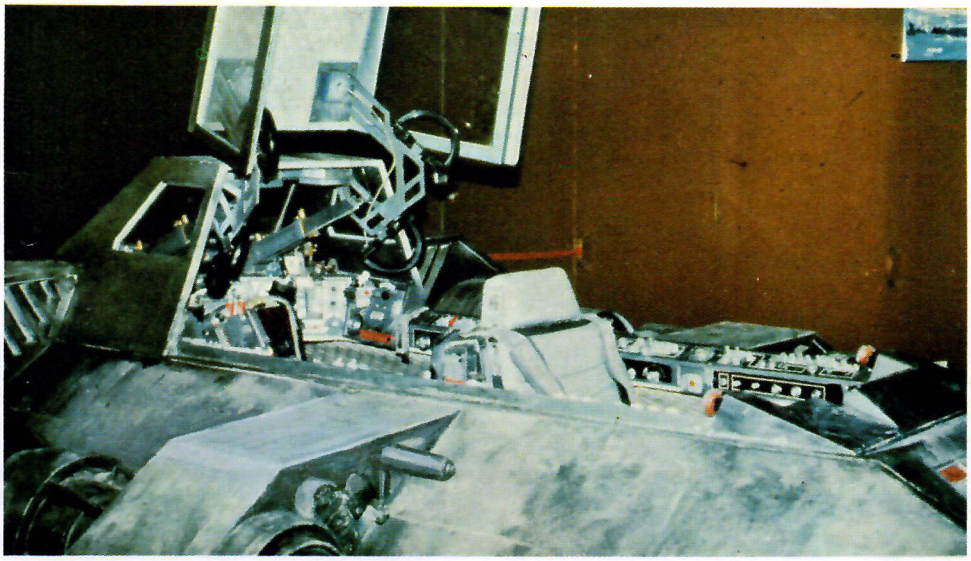
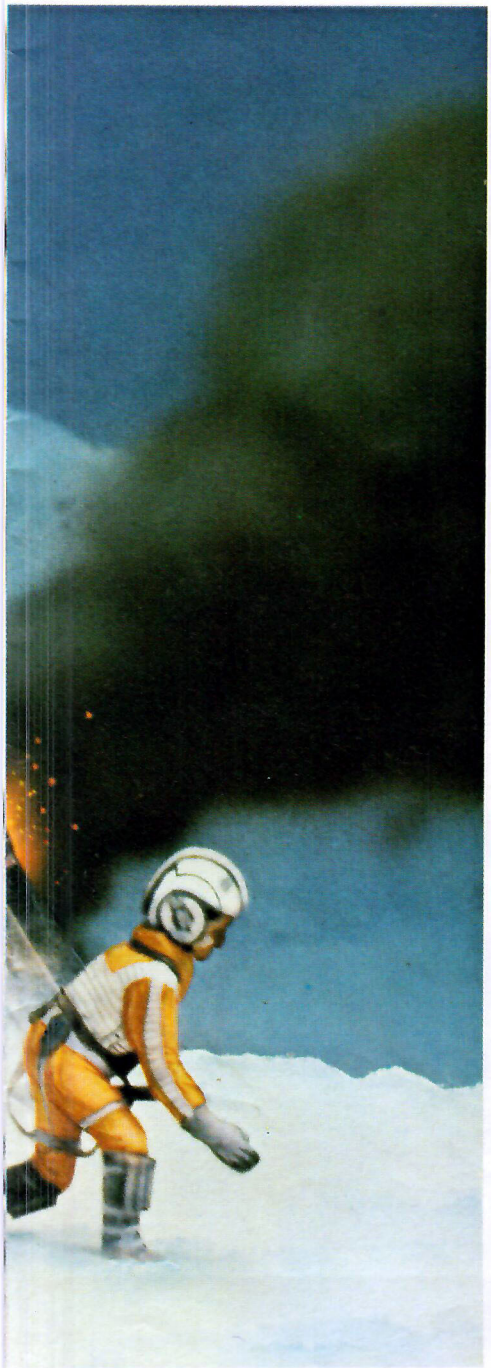
FIGURE 1. COCKPIT FITTINGS

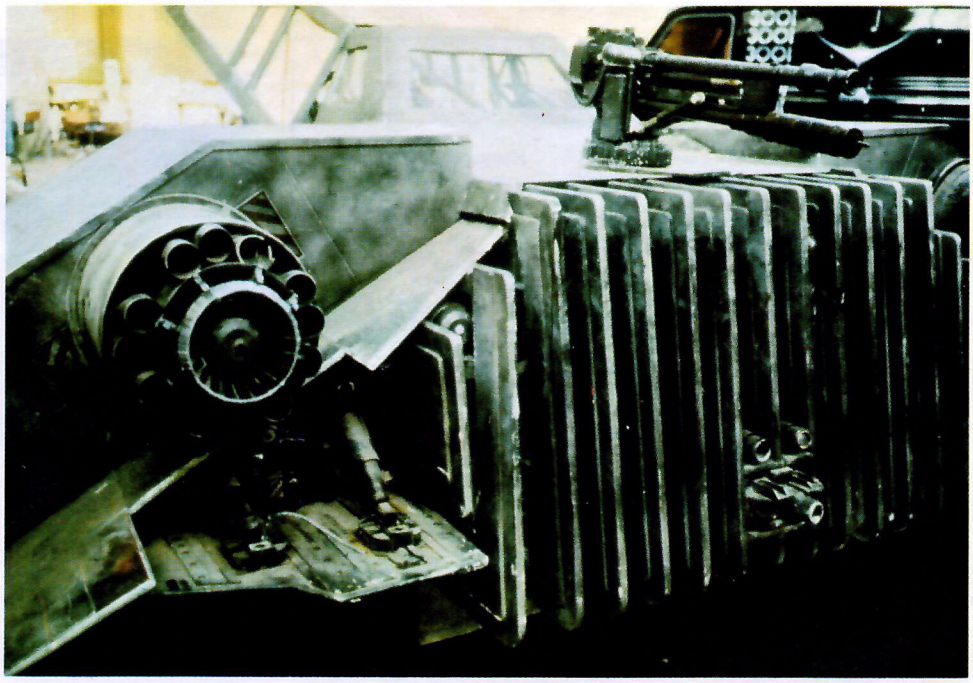

Floormats – scored 5 thou plastic sheet
Footmats
Side consoles – scrap plastic
Detail – Waldron Products
Switches – scrap plastic
Quilted panels – paint pale fawn
Cut away to show detail
Extra 'rolls' for seat – use plastic rod
Side consoles – from scrap plastic
Pin & glue blob grips

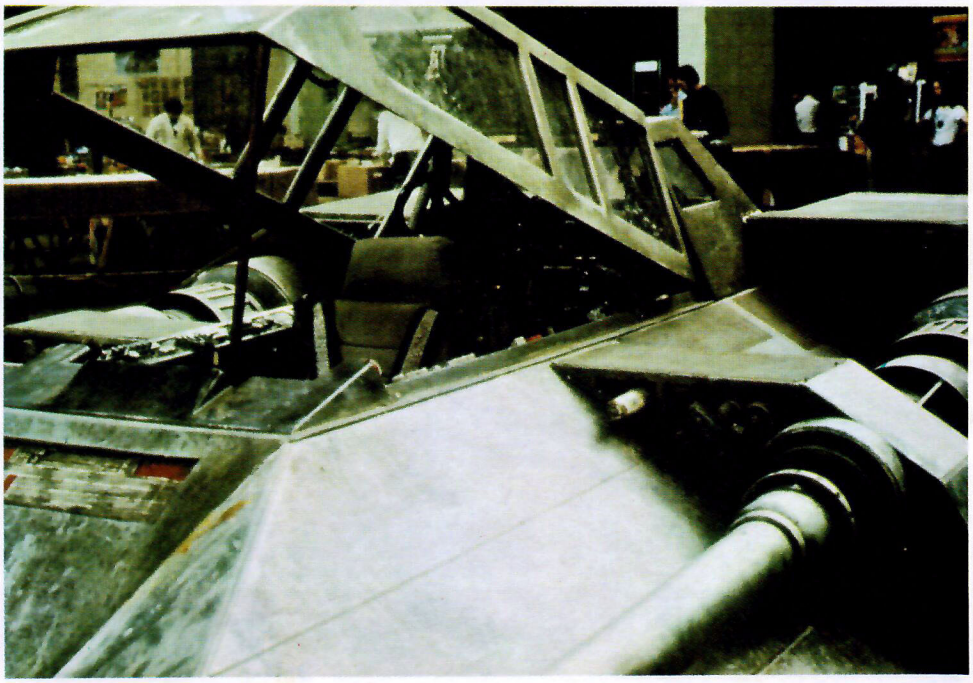












6. The model begins to take shape and construction can proceed with careful reference to the Airfix instruction sheet. Note 'damage' to cannon by careful drilling and cutting away. Upper airbrakes have been cemented shut and new, smooth-skinned panels, cut from 5 thou. plastic card, have been applied over the rear decking – see photo on page 45 of *The Art of TESB*. Some of the raised grille detail on kit *parts 21* and *29* will have to be filed off in order to accept the new panels.

7. The model has now been sprayed overall in pale grey cellulose auto primer (mask off the cockpit area first) and carefully weathered using pastels as described in the previous feature on the *AT-AT*. The new side panels are clearly shown as darker areas and other improvements include the drilling out of all gun barrels and rear engine nozzles *(parts 20A/B)*.

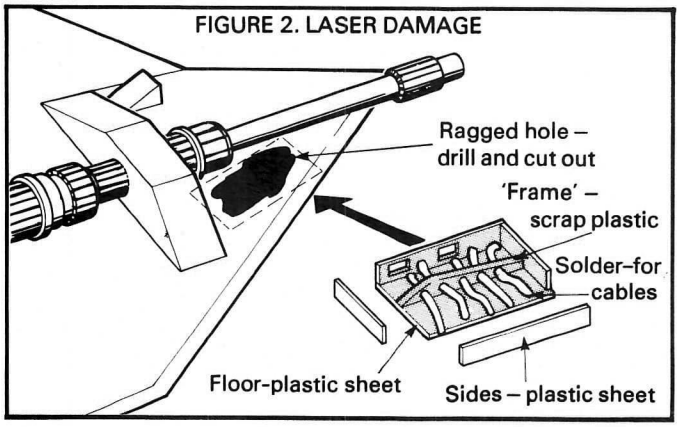
Once all painting has been completed and decals applied, cement the model securely to its base, using 5 min. epoxy glue, and paint the Tetrion surface *matt* white.

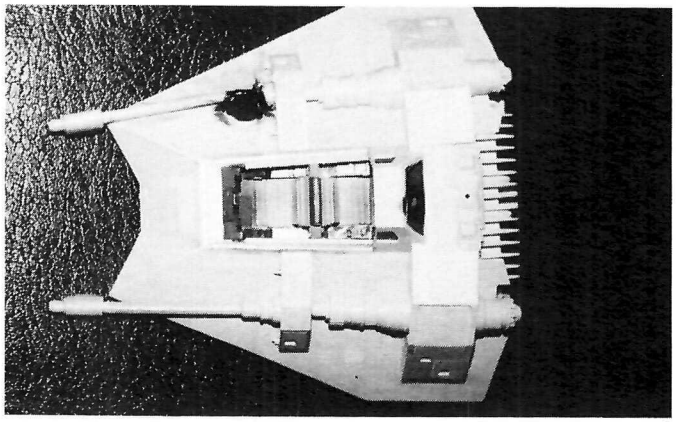
8. The creation of realistic snow in small scale can be a real headache. I tried the lot; white paint, salt, ground sugar, chalk dust and flock but to no avail. None of the many modelling publications could offer reasonable suggestions either so, in the end, I took a tip from **Lucasfilm, Ltd.,** and used powdered baking soda. The powder (avoid breathing it in and use a face mask) is sprinkled on using a tea strainer having sprayed the terrain with **Scotch 3M** Spray Mount available in most artwork supply shops, or direct from the manufacturers, at 3M House, Bracknell, Berks., RG12 1JU. (Tel: 0344 26726). Dust the powder on and blow in one direction so that it drifts into the various nooks and crannies of the *Snowspeeder* in a realistic manner.

9. The stunted crew figures were scrapped and suitable replacements sought. There are literally hundreds of commercial military figures available on the market in both metal and plastic form. Almost any figure in 1/32nd or 1/35th scale can be adapted using **Milliput** model putty and scraps of plastic. My figures were a racing driver from a **Tamiya** car kit (useful for helmets) and a standing marshal from my old **Scalextric** slot car racing days.

Surprising though it may seem, clothing and colouring details are hard to come by for Rebel pilots but almost any *Star Wars* publication should provide details of some kind. As can be seen here, the front canopy hood is fitted out with new glazing, painted, and a quilted panel applied. Handle grips, etc., are formed from scrap plastic rod or soft wire.

10. The canopy hood was originally planned to hinge upwards on my model but proved an impractical exercise. In the end I cemented it in the open position using five minute epoxy.

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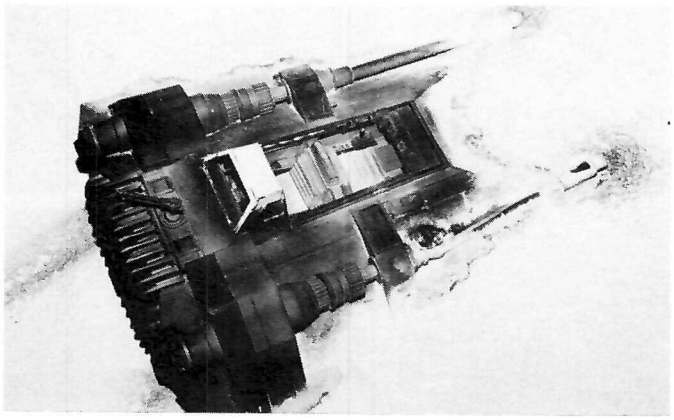
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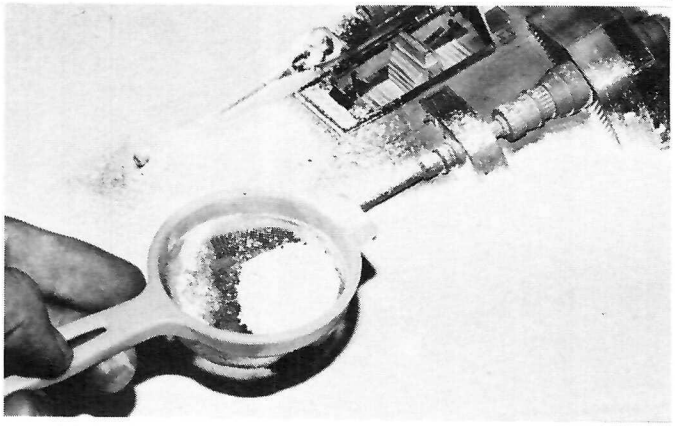
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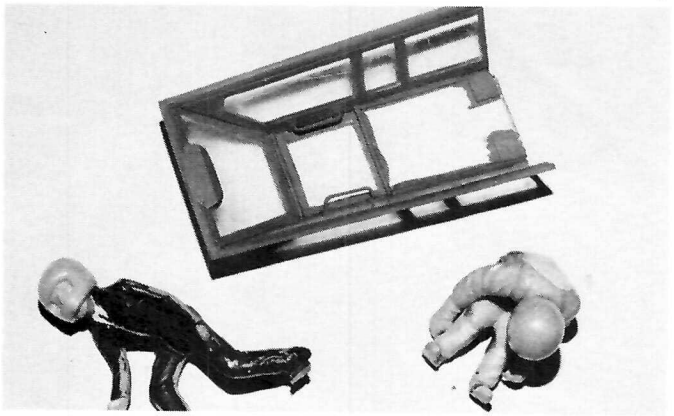
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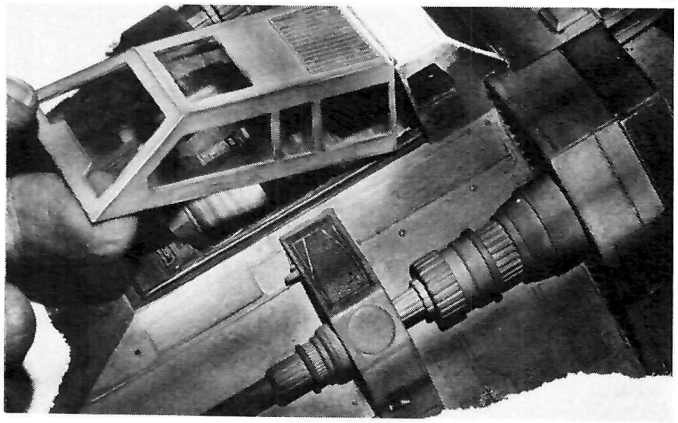
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adhesive. Note pastel weathering on rear of model and over hood, laser cannon, etc.

11. Complicated hinge mechanism, and four handle grips (the dummy kit hinges were scrapped), are evident on the full-size mock-ups and *TESB* production drawings. These were carefully cut from 10 thou. plastic sheet, although some difficulty was experienced in producing them. Soft wire doubled for the handles. Further details were applied prior to installing Luke's stricken gunner. Waldron Products' items provided the seat buckles while strips of masking tape supplied the harness detail for both cockpit and figures. The cockpit 'scanner' *(parts 12A/B)* was not used since no item like it could be found in the various references.

Other points worth mentioning include the small rectangular airscoop *(part 17)* on the starboard side just beneath the cockpit. Discard the grille provided and file finer edges to the scoop before cementing to the upper hull. Note also, here, the pastel weathering of the cockpit area and additional plastic rod strips around the cockpit edges.

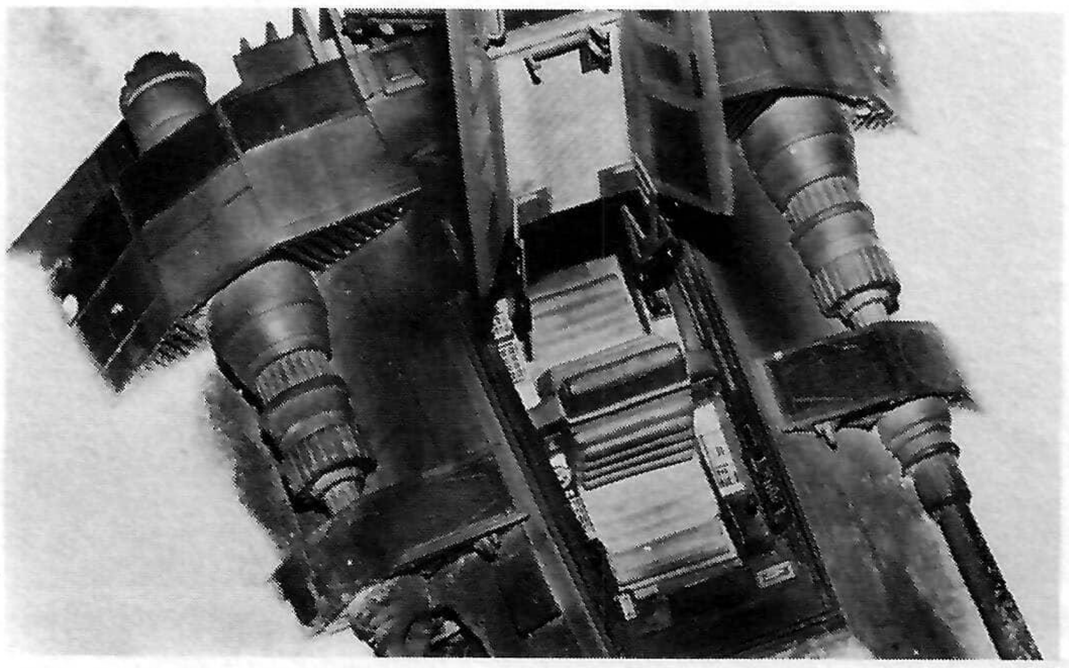
12. When cementing the figure of Luke to the base, I used epoxy glue for rigidity. While the glue sets, prop the figure upright using suitable heavy items such as a paint jar or roll of masking tape as seen here.

Having completed the model to my personal satisfaction, it was set up for photography in a similar fashion to the *AT-AT.* For the advancing Walker I used the large **Palitoy** plastic toy since it is almost of comparable scale to the kit *Snowspeeder.* Steve Archibald's airbrush wizardry added final touches to complete the project.

Our next model feature will be somewhat different for we'll be showing you how to scratchbuild freelance designed spaceships using the most unlikely of household materials. *

Credits
Models and b/w photography: Ray Rimell.
'Special effects' airbrushing on colour photograph: Steve Archibald.
Studio Colour Photography: Ray Rimell.
Handprinting from original transparency: **Colab, Ltd.,** of Coventry.

Acknowledgements
Many thanks again to Susan Trembly of **Lucasfilm, Ltd.,** USA for providing colour transparencies and production drawings from *The Empire Strikes Back.*



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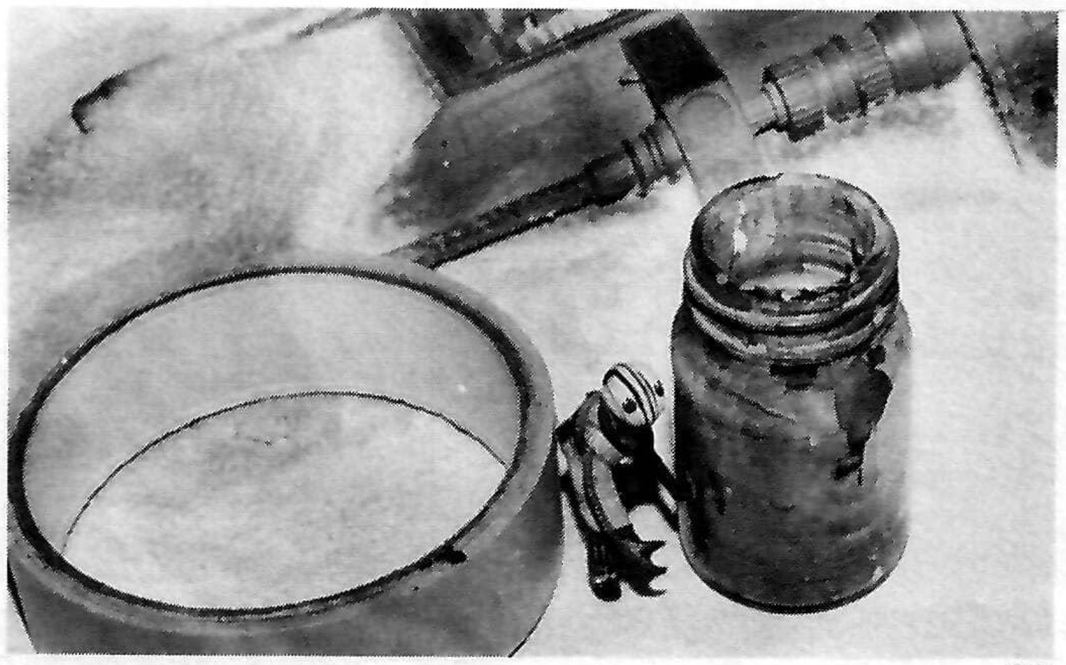

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Above, the author's completed model specially staged to represent one of the exciting action sequences in The Empire Strikes Back. *AT-AT models in the background include the Airfix kit, described in the first issue, and a modified version of the large battery operated toy produced by Palitoy.*

Next kit release is Slave I which will form the subject of a detailed feature in a subsequent edition. Photo: Ray Rimell.

KEY TO COLOUR PLATES ON PAGES 62 and 63

1. A large scale SFX Snowspeeder; the pilot's and gunner's heads are motorised for movement during filming. Photo: Howard Stein. *2, 3, 5 and 6. Full-size Snowspeeder mock-up offers a rare opportunity to study details yet it differs from miniatures built for the film in several respects.* Photos: Mat Irvine. *4. The Airfix kit, super-detailed, weathered and suitably posed for this issue.* Photo: Ray Rimell.

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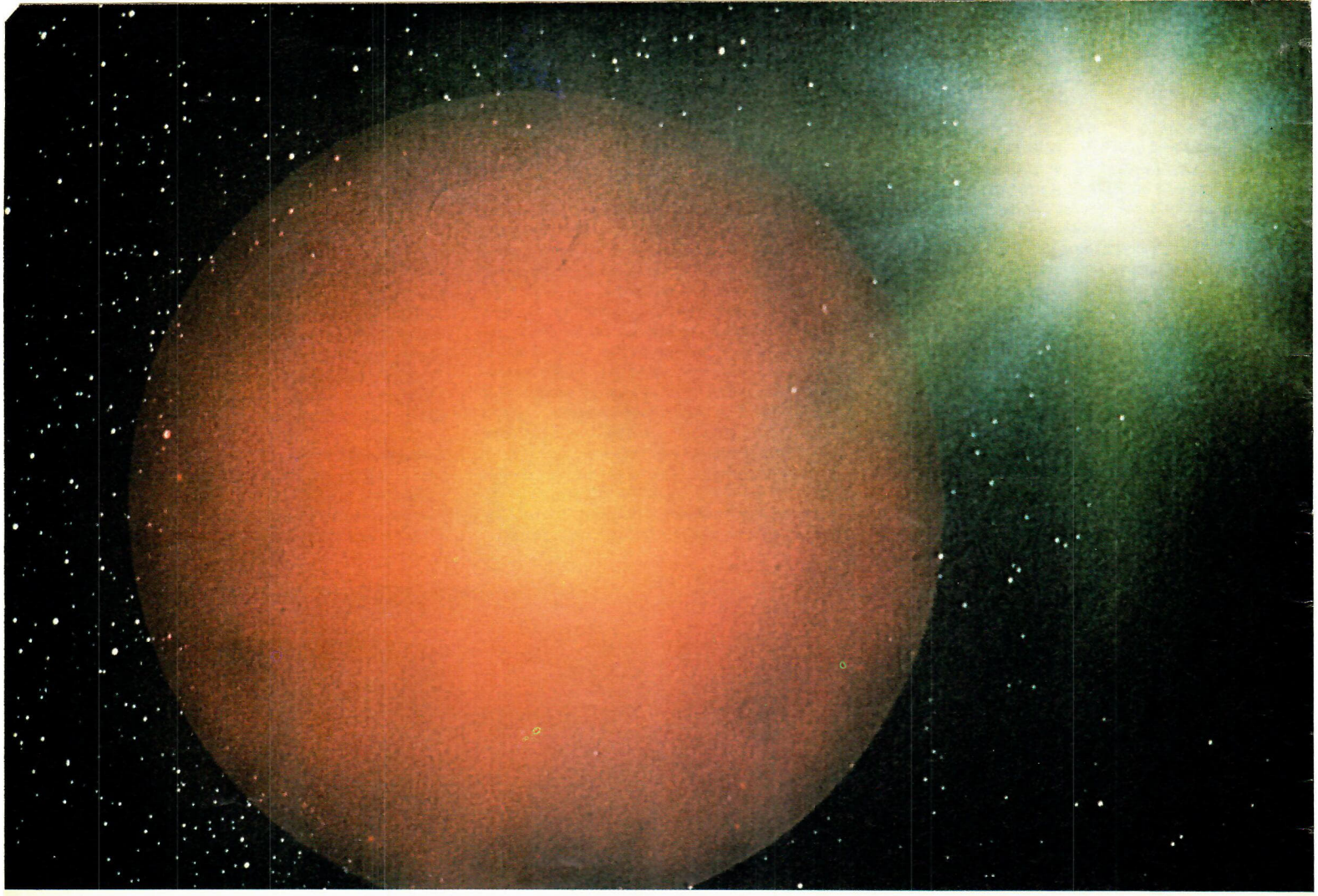


THE BIGGEST STAR?

EPSILON AURIGAE DISCUSSED BY HEATHER COUPER OF THE GREENWICH PLANETARIUM

Nearly everyone's had the experience of looking at a picture or diagram in a book to find that, for the rest of their lives, they cannot get the image out of their mind. As usual, it happened to me when I was about ten; just the right age for desperately needing to know the biggest, heaviest, longest, shortest, smallest of *everything.* I also happened to be a keen young amateur astronomer, and so it was a matter of some importance to me to know which was the biggest star.

I turned to Patrick Moore's *Guide to the Stars,* and read what he had to say on the subject. Although there was no definite candidate, he explained, there were some pretty huge contenders – one of them being the 'secondary' star in a double-star system called Epsilon Aurigae. And then I glanced at *the* diagram. It showed the giant star on the same scale as the Solar System. Epsilon Aurigae's vast companion stretched all the way past the orbit of Earth, beyond Mars and Jupiter, and ended far out just past the orbit of Saturn. I couldn't believe that a star could be so huge; almost 3000 million km across, and capable of swallowing 8500 million suns!

The scene changes to 1971. By then I was studying for a degree in astronomy and physics at university, and the astronomical world was buzzing with the idea of black holes. Reading a scientific journal, I was alerted by the magic words 'Epsilon Aurigae', only to find that, far from being the biggest star, there were some scientists who thought that the companion star was actually a minuscule black hole, surrounded by a vast, swirling *accretion disc* of infalling material.

Eleven years pass, and my astronomical leanings have now left individual stars and planets behind. My heart is set on galaxies, and on teaching astronomy. And when, at a dinner after an astronomical meeting in early 1982, Patrick Moore asked me if I'd like to collaborate with him on *The Sky at Night* again, my thoughts instantly flew to the most distant objects in the Universe. But there's something familiar about that particular year. 1982 rings a bell, and I realised why; it's the year when Epsilon Aurigae was to perform one of its rare hide-and-seek acts. Suddenly, that diagram, with all its associations, flashed through my mind again as vividly as it did two decades ago. Patrick enthusiastically agreed to do a programme on 'The Biggest Star', and we were both off to research our respective contributions. A true story with a happy ending – but if only the story of the star itself was that straightforward!

Epsilon Aurigae is far from being one of the most distinguished stars in the sky. During these winter months, you can see it shining dimly at the apex of a triangle of faint stars next to brilliant yellow Capella in the constellation of Auriga. However, there's more to it than first meets the eye. German amateur astronomer J H Fritsch discovered, in 1821, that it varied in its brightness, a fact confirmed by later observers who discovered that it had one of the longest periods of variation of any star known. It took over 27 years to complete one cycle, taking nearly a full two years of this period fading down and then up again, with 330 days at a near-constant minimum of only half its normal brightness.

Because it was unlike any other variable star, astronomers made a special study of Epsilon Aurigae during the 1901-03 'fade'. Using a spectroscope – a device which spreads out light into its constituent wavelengths, in the same way that raindrops disperse sunlight into a rainbow – another German, H Ludendorff, was able to come up with part of the answer. Epsilon Aurigae was a double star, he reported, for he could see the tell-tale to-and-fro shifts of the spectrum of the bright component as it orbited its companion. The fades, then, happened as the bright component was periodically blotted out ('eclipsed') by its darker companion. But of the companion in this *eclipsing binary* system, there was no trace. It gave out no light, and so no spectrum could be photographed; but there had to be *something* there to cause the eclipses. Baffled, Ludendorff concluded that the Epsilon Aurigae system must be made up of a yellow supergiant star orbited by a huge, mysterious, dark cloud. In his own words, 'a swarm of meteorites'.

Time passed, and astronomers were able to estimate a rough distance to the system. By 1937, they were in a position to 'weigh' both components from a knowledge of how they orbited one another. And as Gerard Kuiper, Bengt Strömgren and Utto Struve pointed out, we were dealing with a pair of real celestial heavyweights. The supergiant's mass was in the region of 15-30 suns, while the mystery companion weighed in at 10-20 suns – countless billions of times too massive to be a meteorite swarm. The three astrophysicists hazarded that the companion must indeed be a star, but one whose properties were positively mind-boggling. It needed to be 3000 million km across in order to cause the lengthy eclipses. And it had to be completely dark to elude detection by sensitive spectroscopes. In short, this was the 'biggest star' which must surely have stirred the imagination of more than one star-struck ten-year-old.

Unfortunately, it's often the way that things which stretch the imagination do likewise to the laws of physics. The romantic notion of a star billions of times larger than the Sun could be shot through with holes. Where was the radiation? Even a star this cool (1000K, estimated the theoreticians) should be half as bright as its supergiant companion, because of its sheer size. There was the not inconsiderable embarrassment that the dark companion was evidently transparent, for even in the deepest part of the eclipse, the supergiant 'primary' star could be seen shining through. And, as if to dispel all notions of dark, transparent, super-supergiant stars, other theoretical astronomers pointed out that anything this big would be hopelessly unstable, and so it couldn't exist anyway!

Solutions

So, what's the latest thinking on the mystery object? There are three possibilities on offer, and each sounds almost as bizarre as the 'big star' theory. But the trouble with Epsilon Aurigae is that astronomers only get a good chance to investigate it every 27.1 years; that is, when it goes into one of its eclipsing 'fades'.

The last eclipse occurred in 1955-57, and it gave rise to a respectable heap of data which scientists could mull over at their leisure. First to try and make sense of the observations were Manchester University's Zdenek Kopal and (independently) Su-Shu Huang, who proffered modern versions of Ludendorff's meteorite swarm. Both reckon that the Epsilon Aurigae system is a real celestial infant. In fact, it's so young that the unseen secondary hasn't properly formed into a star yet, but consists of a disc of swirling gas and debris collapsing to form a star and its surrounding planetary system, just as our Sun and planets were born some 5000 million years ago. The swirling disc is opaque, but angled in such a way that it neatly bisects its bright supergiant companion on each eclipse and thereby lets half its light through.

It's an elegant idea, but objectors point out that if the system really was this young, and as massive as we think, we should see it changing before our very eyes. Computer simulations tell us that massive stars collapse extremely rapidly. We'd expect to see evidence for this in the supergiant 'primary', and outpourings of infrared ('heat') radiation from the still-forming 'secondary' – but we don't. And there are indications that Epsilon Aurigae isn't that

For years, many astronomers believed that Epsilon Aurigae's dark companion was one of the biggest stars in the Universe (top left). But is the mystery star (opposite) really a cloud of dust and gas collapsing to form a planetary system? Artwork by Paul Doherty.

young, anyway. Stars are born in groups, and some astronomers believe that Epsilon Aurigae is a member of a loose cluster of stars which are all about $6\frac{1}{2}$ million years old. Because massive stars live so furiously, they evolve rapidly, and this short timescale (by astronomical standards) is close to retiring age for the kinds of stars we're dealing with here.

Harvard University's AGW Cameron goes one step further; he reckons that Epsilon Aurigae's unseen component has actually died. Ripping through its fuel, it went through its life-cycle so quickly that it suffered the fate that astrophysicists predict for stars weighing in at more than ten suns. With its energy reserves gone, it was unable to hold up against its own relentless gravitational forces. It suffered runaway collapse, until it became so compressed that not even light could escape any more. In short, it became Nature's ultimate freak – a black hole.

Of course, the black hole itself is too small to cause the eclipses. A black hole with a mass of ten suns would be about 30 km across – about the same size as the Isle of Wight! But surrounding the hole, trapped in its gravitational maw, is a raging vortex of material spiralling inwards. It's this accretion disc, claims Cameron, which causes the periodic eclipses.

Exciting stuff, and every bit as mind-blowing for today's young astronomer as the giant star of several decades ago. But is it any more realistic? No, say other astronomers, who point to the fact you'd certainly expect high-energy radiation (in the form of X-rays) from material disappearing at the speed of light down the black hole's throat. And where does this vast reservoir of material come from? Not from the tenuous medium between the stars; and almost certainly not from the supergiant companion, too distant to have its gases snatched. Cameron also requires his accretion disc to orbit the bright supergiant in an 'upright posture' in order to cause the eclipses – and this isn't stable, say celestial mechanics experts.

The explanation for the mystery star may, in the end, turn out to be almost routine. Margherita Hack, of the Trieste Observatory in Italy, suggested in 1959 that the unseen companion was a hot, small blue star surrounded by a thin shell of gas. The intense (ultraviolet) radiation from the star made the shell opaque, and the shell gave rise to the eclipses by 'bisecting' the main supergiant star in the same manner as Kopal and Huang's planet-forming disc. The key to the mystery would be to find the tell-tale ultraviolet radiation. But it's not as easy as it sounds. Luckily for us, ultraviolet radiation (which in large doses can cause skin cancer and severe burns) is almost completely absorbed by our atmosphere. Not until the International Ultraviolet Explorer satellite was launched in 1978 were astronomers able to get a good measure of the ultraviolet Universe.

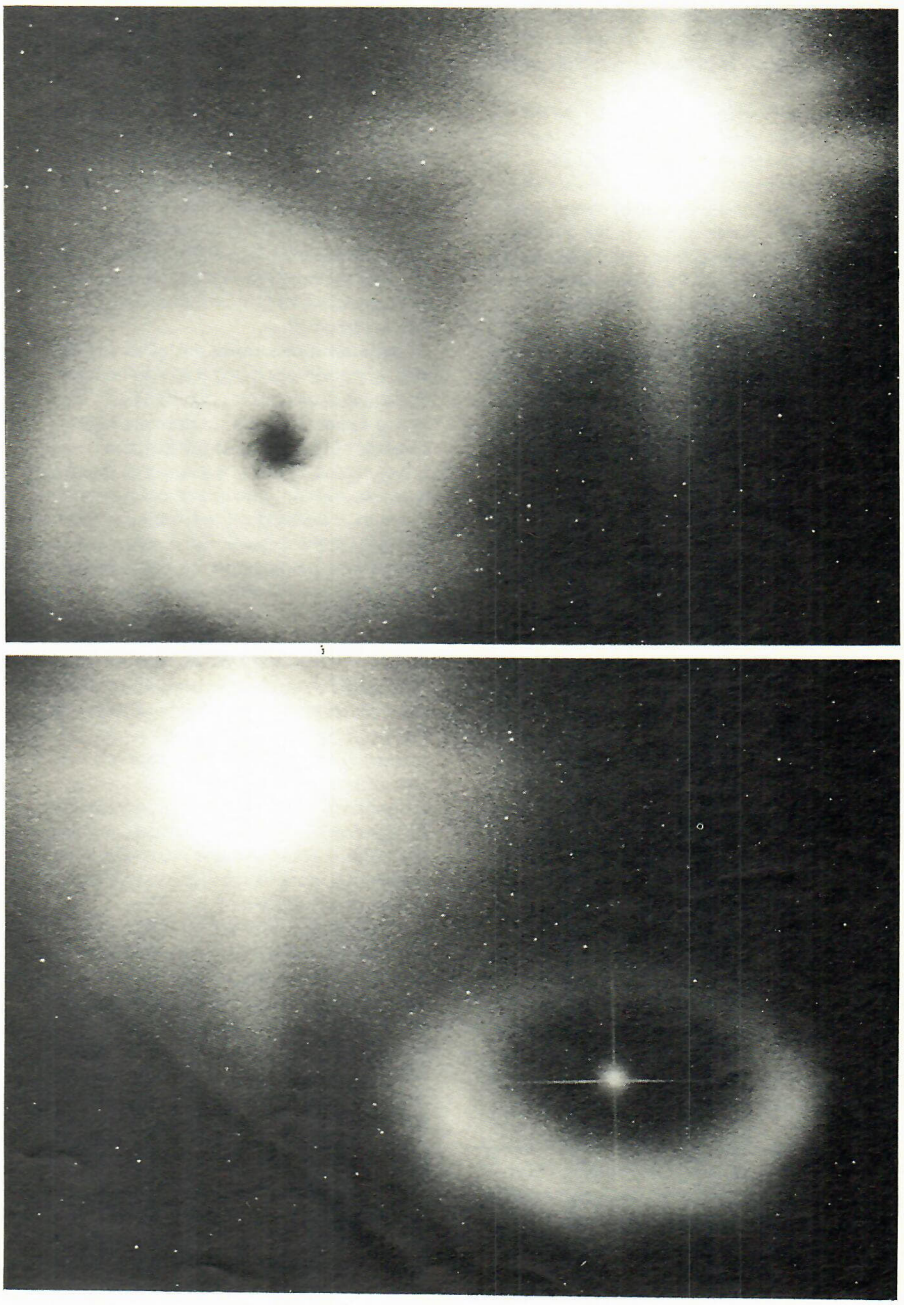
IUE took in Epsilon Aurigae on its wide survey. The first results were encouraging; there seemed to be enough radiation at these wavelengths from the system to suggest that the companion could well be a small, very hot blue star. Further, although the gas shell which caused the eclipses would have to be hundreds of times heavier than those which are normally 'puffed off' by stars, astronomers at last seemed to be on the right track.

But recently I learned that all was not well. The first results were misleading, reports Professor Hack, because the satellite performance was still being evaluated. Now it seems that there isn't enough radiation coming from the system. The companion 'shell star' – if that's what it is – isn't hot enough. So where does that leave us?

My feeling is that we've come full circle. Many outlandish theories have been hung on this strange system in the hope that they will fit, and every one has gaped badly at the seams. But now it's time again to listen to what Epsilon Aurigae is telling us. It started its latest eclipse on July 22, 1982, and it is well on its way down towards minimum brightness and will end on January 16, 1984, and the eclipse be all over on June 25 of the same year.

Astronomers are now watching the peculiar star-system as never before. Amateurs and professionals are joining together in another attempt to crack the puzzle. Even IUE is joining in from its silent eyrie above the atmosphere. And when all the data are gathered in, the theoreticians will set to work – again.

When all is said and done, we will probably find that the explanation for Epsilon Aurigae is quite mundane. It is seldom that we find a truly unique object in astronomy, and like most astronomers, I'll be glad to see the poor old (or young?) star system used as something other than a dumping-ground for far-fetched theories. But, try as I might, I still can't rid myself of that vivid first impression of the largest star in the Universe. If we do succeed in solving the riddle with this eclipse, Epsilon Aurigae is never going to be the same for me again!



Top picture: it's just possible that Epsilon Aurigae's dark companion could be a black hole surrounded by a swirling accretion disc but perhaps the most likely and most exciting theory (right) is that its companion is a small blue star surrounded by a shell of gas. Artwork by Paul Doherty.

COMMUNICATIONS BANK

First issue feedback . . .
Dear Sir,
Talk about off to a fantastic start! *New VOYAGER* was brilliant, just the sort of quality magazine that thousands of us were waiting for! I would list each article I enjoyed but they were *all* great; you've got the formula 100% correct so don't let up!

Please print this letter because when you reach your 500th issue I want to be able to prove I was 'there' from issue one!
Swindon *Nick Brett*

Dear Sir
After enjoying *Space VOYAGER* so much I am glad to find out that this publication will be produced at regular intervals, albeit under a partially changed heading.

New VOYAGER is something that we in this country have long waited for. Our very own informative magazine of this type. For too long now the British market has been dominated by American publications. Now thankfully, we have one we can call our own. I look forward to reading future issues of *New VOYAGER*.
Glasgow *Thomas O'Neill (President ANSA)*

Dear Sir,
I am writing to congratulate you on an excellent magazine and I am glad you are starting up again after your brilliant pilot issue. As well as congratulating you I am writing to ask a favour. I have recently purchased the **Airfix** *AT-AT* model, which is the model made by Ray Rimell, and I wish to incorporate lights in the same way as in the model project but cannot find anyone that sells Fibre Optics. I was wondering if you could help me in my search by supplying me with the address of somewhere where I may purchase it?
Formby, Merseyside *Neill Gorton*

Thanks for your kind words, Neill. In regard to the 'AT-AT', we obtained our Fibre Optics from Makemass, Ltd., of Crayford, Kent while another source is Proops Brothers, Ltd., 52 Tottenham Court Road, London W1P 0BA.

Dear Sir,
I have recently read the first issue of *New VOYAGER* and must congratulate you on an excellent magazine which fills a huge gap in a growing market. I feel *New VOYAGER* is well balanced; not an easy task. For added interest, I would humbly suggest the following:

1. Please include a science fiction/fantasy story each issue if possible.
2. Please include a 'readers' questions' item, particularly for modelmakers.
3. May we have the opportunity to purchase binders for our copies to keep them in pristine condition?

Unfortunately I have one complaint, and that is the constant use of initials (*eg.* SSME, MEA, ST, TMP – the list is endless).

Finally, I must congratulate Ray Rimell on his article on *Star Trek II, The Wrath of Khan.* It was well written and almost reflected my own views on this fine film!
Poulton le Fylde *Ian Tracey*

Your comments are all noted, Ian. News of SF story plans will be forthcoming and a readers' letter page has already been initiated with this issue. Rest assured we are also looking into the possibility of producing special binders.

Dear Sir,
Just as I was beginning to doubt if we would ever see a second issue of *Space VOYAGER,* there it was sitting on the shelf: *New VOYAGER.* Congratulations on getting things off the ground to all concerned. Britain really needs a magazine like yours, so keep up the good work. And it is nice to see a magazine that is as slickly produced as any American rival on the current market.

I loved the article by Alan Bond, great stuff, and not too technical either. The artwork with Patrick's article on Venus was great too. If possible, could we see more such artwork, particularly any by David Hardy. (*In the pipeline! Ed.*). Nice to see some different shots of the Shuttle and from *Star Trek II* and *Blade Runner.* I could go on for pages complimenting various aspects and articles but it would border on the monotonous, I'm sure! Suffice it to say the magazine is pretty amazing. One fault though, in my opinion anyhow, the layout of the book reviews seemed better in *Space VOYAGER* and, although I do realise it would take up more space, I believe it to be worthwhile to revert to the previous format.

Now it's suggestion time: How about an article on a *Millennium Falcon* diorama? This model has numerous possibilities for super-detailing and for incorporation into some form of diorama, such as the Tatooine launch pad or suchlike. Other articles I personally would like to see could include such diverse subjects as pyramid power, electronic music, musical instruments and techniques included in home movie SFX, to name but a few. How about it, lads? Oh, and also, how about a short story each issue helmed by a reader or member of staff, rather than an already-established writer.

Finally I come to my last point, and it turns out to be a whole-hearted compliment, not surprisingly! In fact it regards not any article, or suchlike, but the sheer quality of the photos reproduced. Both you and your printers can be congratulated on the colour pics and the exceptionally clear black and white photos which are the best printed shots I have encountered in virtually any British magazine.

Live long and prosper.
Southam, Warwickshire *A D Nettle*

The new book layouts were, as you suspected, Mr Nettle, designed purely to present more reviews. It is not really necessary to illustrate every one, we feel; some magazines run such columns without any pictures at all but we will use as many as we can fit in for future issues!

Our correspondent's AT-AT displayed on a Plaster of Paris base with Snowspeeder attached. The latter is light enough to be held with thin wire, giving a realistic appearance, and is attached to a rear leg, then wound around all four and finally discreetly secured as it passes the top of the foreleg.
Photo: P. Cooper.

AT-AT modelling
Dear Sir,
At last – a magazine on the bookshelves for the adult SF enthusiast! For far too long the only information obtainable on this subject has been confined to comics and children's books. As we move forward into the 21st Century it is only right that we have a magazine to keep up with the times.

I was delighted to read your article on the construction of the *AT-AT* as I had just finished a model of the smaller version from the *Battle on Hoth* kit. The smaller *AT-AT* is very easy to construct having only eight pieces in all and is a good starting point for a novice modeller like myself.

I have, however, been very disappointed with the availability of models of this type as the bias still stays with military aircraft and vehicles with SF only just starting to make a real appearance in the shops. Mail order could be the answer, but from where?

I recently acquired two Japanese kits of robots, each approx. five and a half inches high when made and bearing the name of **Aoshima;** as all instructions and details are in Japanese I have not been able to find out where to get any more. Perhaps you can help? I have heard that SF kits are much more freely available in Japan and are beginning to take over from the traditional kits; hopefully a better range will soon be more widely available here too.

Please could we have some articles in future on the scratchbuilding of spacecraft as I am hoping to try my hand at this soon. *(See next issue. Ed.)*
London, SW17 *Mrs P Cooper*

PUBLISHERS' NOTE
The editor reserves the right to shorten letters for publication; opinions expressed by readers are not necessarily those of either the editor or publishers.

TRON

Continued from page 45

V: *Were there many things that were done by hand animation?*
HE: Yes. More than people realize, in fact. Often, our hand animation looks more like it's done by computer than the computer animation!

That was obviously intentional. The computer gets pretty good these days and if you're not careful, you have to go back and add a couple of grids somewhere so people don't mistake it for traditional animation! (Laughter). Really! There was the intention that the whole film looks as if it was done by computers.

There was a lot of effects animation in the film. Basically, every time a disc goes up in the air in the game grid sequence, that was all hand animation – and we call that kind of stuff, effects animation.

Effects animation, many people feel, is a lost art. But it's always been around in animation, for rain, lightning, snow, explosions and things like that. Well, we had a lot of use for effects animation in *TRON,* and we were rather fortunate in getting as many good people as we did.

It integrates I think very well with the look of the film. In fact, it's one of the few things in *TRON* that had been done before. The effects animators were early heroes – their dailies came out looking great, right off the bat! But, heck, they had prior experience with that kind of stuff! So it became a running joke in dailies, if a shot looked great, one thing you could always count on was the effects animation. It was great to be able to rely upon them. We just kept putting more and more in. Originally, we intended to have only four effects animators, but it worked so wonderfully well, and added so much to the film, that we just kept adding more people to the staff, and doing more of it.

Another thing that is hand-animated is Flynn as he's being 'de-rezed' (Turned into particles by the laser beam prior to transfer into the electronic world. **RL.**). John Van Vleet has to be insane to draw all of these little boxes around every portion of the actor's body, and then take out the boxes one at a time! It took him and his assistant a long time to do it, but it looks as if it had been done by computer. Everybody thinks that's the first place where we used a computer, but it's not. There are a couple of opticals in there, but the rest is large transparencies which we animated on top of.

V: *Was there enough equipment at Disney to cover the work not sent to Taiwan?*
HE: We had four cameras for re-photographing the cels here on the lot. We also had nine additional cameras off the lot, from outside services. That was once again due to time.

They all had to be tied down, standardized, with the same kind of light box, etc., the same language had to be used so that they knew what we meant when we said certain things on the exposure sheets. It was a problem getting everybody set up, going in the same direction, but eventually we did.

We once had a guy at one of the outside camera services who was a heavy smoker. We couldn't understand why these particular shots kept getting softer and softer. I was going crazy! We sent someone over and told them to tear the camera apart, because something was wrong. Finally, it was just a matter of taking the lens out and cleaning it off! It took us five days to find that simple problem. But then suddenly, they were all clear again. From then on, we sent him some lens tissue and a little alcohol to clean off the lens more than once every three years!

But that's the kind of thing that would happen. Everything would be running along smoothly and then somebody else would have problems. With 13 cameras, there was never a dull moment.

V: *Were you equipped to deal with all of this psychologically?*
HE: No! I mean, yes, yes! (Laughter). People perceive working on a film in so many different ways. Most of the people in our visual effects and post production unit had never worked on a feature length motion picture before. Most of them came from commercials. It was very difficult to get it through their heads that this was not a commercial, and not to treat it as such.

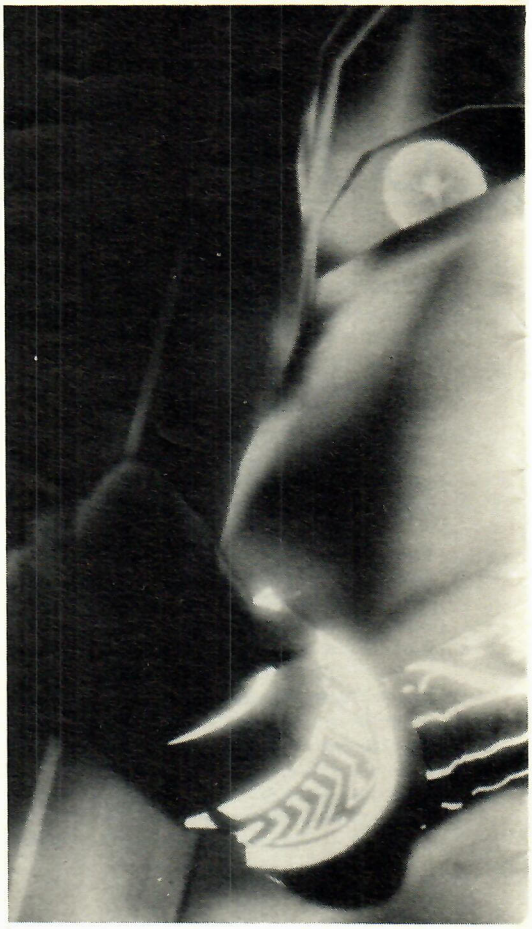
Number one: they had far more work to do. Number two: they had to make more compromises and number three: they had a date that absolutely could not move. It was etched in stone!

With commercials, if it doesn't look right by the date, they say, 'We'll take another three weeks. The client really wants it to look right.' Well, we said we really wanted this thing to look right but it damn well better be done on time, because that's what the studio said. They said, 'Look, July 9, and by the way, it'd better look good!' So, they were real understanding!

After some of us had expressed our doubts and fears about this date, and been told in no uncertain terms that this was what had to be done, I knew that this was going to be my most frustrating job. It was difficult to convince the people of this, especially the scene coordinators. I would say that 90% of them did not believe it could be done. They thought they were being hired here for the rest of their lives. They said, 'Wow, look at this, 53 minutes of continuous effects, it's great! I'll retire here, I'll have all the benefits, I'll be a permanent employee, it's wonderful, I'll never have to find another job again!'

They just really didn't get into the understanding that it had to be done, and that it would be done, but that it was a matter of how clever we were or how good it would look. Because you can always make another compromise; you can always say, 'Well, the heck with it, we won't use circuit reveals here. They'll be all one colour instead of two different colours.'

Finally, they did come around. Obviously, everyone was a believer in the end. But, psychologically, I think that this was the thing that frustrated me the most. To give people the 'speech' and afterwards, they'd come by and say, 'Come on, Harrison, you know it's not going to get done!'

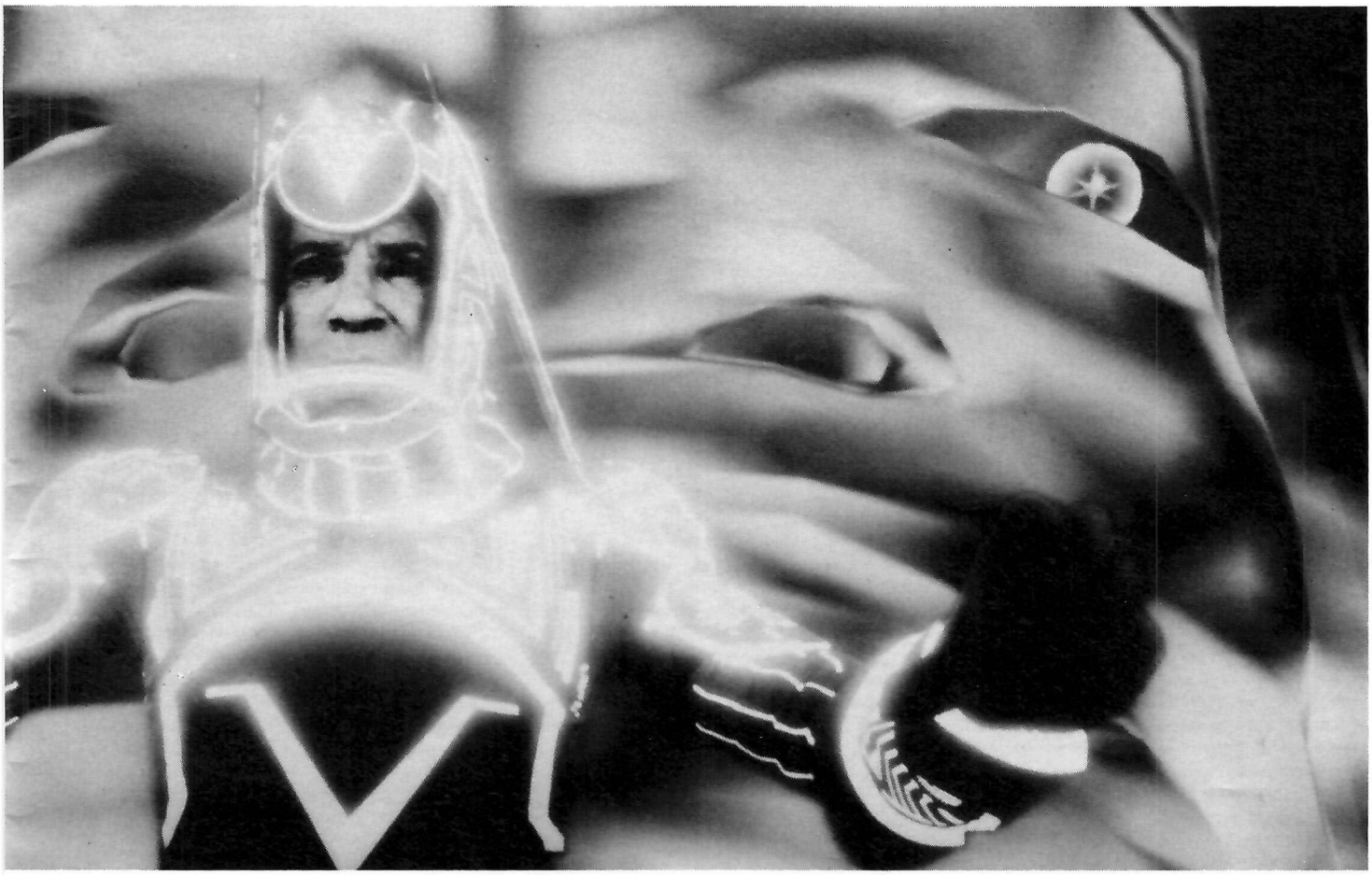


That really infuriated me. I perceived that as a negative attitude and I think that no matter how difficult it is, you have to convince yourself that, yes, you're going to do it.

The other difficult part that I always have difficulty dealing with was that with so many people involved, you're always going to have a few people who have a little bit of a problem in dealing with others. Well, that's life. We had, perhaps, 85 key creative people here on the lot, and I would say that 82 of them were terrific. Those other three took about 50% of my day . . . Everybody goes through that, but it still bothers me. The reason why some of them stayed was that they were very, very good at what they did. So it was just a matter of keep stroking and saying, 'Yes, it will be all right. Get back to work!'

V: *Why did you have so many people with a TV commercials background?*
HE: Because that's where backlight compositing really has its basis. Nobody has ever done 53 minutes of backlight compositing in a film. In fact, nobody has probably done backlight compositing in a film, period, So that was the natural place to go and find them.

V: *Was there much problem in coordinating the live action events so that they would fit with the backlighting afterwards?*
HE: Well, that was Steven's problem. But fortunately, he had it in his head what he wanted the film to look like. So then the problem was to verbally transmit that image. He also had the use of storyboards and the illustrations. But we had a unique advantage,



Sark (David Warner), who has decreed that peaceful computer programmes be put to 'death' on the video game grid, is backed by the Master Control Programme. Photo: Copyright © 1982 Walt Disney Productions.

that if somebody reacts in a certain way to an event, if it looks as if they're not reacting enough, well, you just tone down the event a little bit. So you can kind of fit the backgrounds and the action sometimes to fit the people. You're working backwards, so to speak.

And even if they look a little bit off cue and not quite the way you intended it, you can still use it. You can just make the disc go by at the correct time. So there is that advantage, along with the disadvantage for the actors of having to work on a blank stage. I'm sure that it was very difficult, but I think that it was nice to have Steven have his concept ahead of time.

V: *What did the sets consist of?*
HE: Well, we had the interior of the recognizers, the interior of the tank, the holding cells, etc., all white with black lines. We also had set pieces in black, so you could walk up stairs, etc.

V: *How did you work out Flynn's disintegration with the background sets?*
HE: We had about 20 quick cuts. It was often used optically, or we took a frame of the film and blew it up into a transparency. Once he freezes, you can use a still frame and go over that. There's enough action on it so it doesn't look like a still frame.

V: *was there any rotoscope done?*
HE: No. Initially, a lot of people – not having seen the film – perceived it that way. But we tried to avoid that, obviously. Because *TRON* is basically not rotoscope, not animation. It's a live action film that takes place in an animation world, the electronic world. This was a problem. I didn't like to call the stands that we used, animation stands, because, once again, people would think it was animated. It was not.

The thing about not being rotoscoped, not being animated, is really a kind of neat concept, because it makes people look at it in a unique way. I think we came up with a very different, distinctive design, which does not have to relate to a computer world. I hope somebody does something with the whole method that we devised. We've really solved a lot of problems for the next person.

V: *Were there any traditional matt shots?*
HE: There is one done in the 'real' world, where all the desks are shown. You spot it easily.

The backgrounds were painted, but they were then transferred onto 16x20 **Ektachrome** and backlit. Then they were composited as well, so there was no traditional painted matt shots.

None of that was done by computers, although I believe that it will be, very shortly.

V: *Do you think that eventually computer matting will take over from conventional matting techniques?*
HE: Frankly, yes! I think you'll still have paintings being done, but the method of putting the painting together with live action will be done digitally.

Film will be scanned by a computer, just like sound is being recorded digitally now. It will all go into a memory bank, and that way we'll be able to do the matting perfectly right, almost in the computer. We won't have to do it optically anymore.

This would take care of the blue line problem, for instance, but there will be other problems initially. It's not going to be instant. But I'd say in five years, opticals will be pretty well eliminated.

V: *How would you compare computer-generated animation with traditional animation?*
HE: I don't think that this is the issue. You ask this because many of us like to see something new, but also like to associate it with something that we're familiar with. It's the same with computer-generated imagery. You're trying to relate it to what it will replace, such as the optical matting technique, or the colour. Computers are already colouring cels, but I don't think it is intended to replace character animation, which will continue to thrive. On the other hand, if the computer can do so many other things that character animators can't, then why waste their time?

I really look at it as the only thing limiting the technique is the imagination. The technology is advancing rapidly and imagination just has to keep up. In fact, imagination should be ahead of it! It's very frustrating in that we have these tremendous capabilities, yet nobody can say, 'What am I going to do with it!'

One of my first reactions to *TRON* was, 'God, why didn't *I* think of that! We can do it, it's ingeniously simple.' Now, somebody has to take that and go another step. I don't know what it's going to be.

Some fool will probably come along and say, 'Oh, boy, now we can remake *Cinderella* for half the price!' It's such a waste, it's disgusting! It's like prostituting the method, using it for something it was never intended to be used for. That's the TV attitude.

V: *Were you concerned that it would be difficult for the audience to concentrate visually for 53 minutes?*
HE: Yes, it is difficult for an average audience. It's one of the problems of the film. And we backed off loads! Maybe we should have backed off even more.

Steven was very realistic. I wanted for example to have Dumont and the programmes wearing black boots so that they would appear to float across the floor. I also wanted a couple of characters to have more black so that you could have seen right through certain portions of their bodies. But Steven said no, let's not overdo it, because people are going to have a hard enough time grasping this and feeling comfortable with it. If we make it too uncomfortable, they're going to back off and not like it at all.

I think *TRON* is either a film that you love or a film that you hate. I think more people love it than hate it, from those I talked to, although those that hate it don't bother telling me, maybe. It's been very surprising. I've seen some reactions of people I know that wanted very much to like it, but walked out and were very apologetic because they couldn't take it. I think you have to be open minded to new things to like it, and not feel threatened by computers.

V: *Was making 'TRON' a big challenge?*
HE: Oh yes! That's why I said earlier that I was really enthused about doing the film. I wanted to do it very, very badly and be associated with it. No denying that, for me, it was a challenge. It was for everybody associated with it. There was nobody that knew all of the answers beforehand. I was one of the few people that had worked on a feature-length, live-action motion picture before, in any capacity. So it was very difficult for me. People would come and ask, 'Was it like this on *Empire?*' I'd lie and say, 'Oh yes, don't worry about it. It'll be fine.' They'd say, 'Were you a month away from the end date and had that much left to do?' and I'd answer, 'Of course, that happens all the time.' Then, I'd close the door and sob! *(Laughter).*

V: *Would you do it again?*
HE: Yes, I'd definitely do it again! But I wouldn't be real enthused about doing a sequel, for example. I got perhaps more satisfaction out of this film than any film I've worked on. Just because there were so many obstacles.

I can remember, around November 1981, having a six to eight hour talk with Steven, Donald Kushner, Richard Taylor and John Scheele – in fact, it was more of an argument. We were at our wits' end. These inkers and painters were down to the nubs and they'd done four scenes! Four! In *six* months! It just wasn't working. We spent at least eight hours going through all of the options. We were very, very frustrated and disappointed, like 'Oh, we won't get it done, this is it, who's going to tell the big gorilla at the end of the hall! (Laughter).

That's when we finally decided to go to Taiwan, but we had many crazy ideas, like we had 1100 scenes and we would hire 1100 people and each one would do a scene! It would have been like the Army! We'd have lined up all the tables in a big warehouse, and I would have stood in the front, saying to all of those people, 'This is a Stage 1 stencil. Pick up your Stage 1 stencil in your right hand!'

Then we thought of two shifts of 500 people each, or each person doing *two* scenes, and all sorts of details, like how much are we going to pay these people, what about when they want to go to the bathroom, or 'Oh, the hell with that! They won't have time to go to the bathroom!' (Laughter).

We went through a whole set of scenarios and finally discarded them. Then, we decided on Taiwan and Donald got on the plane that week-end and made the deal. He found a place that could do all of the painting and inking in three and a half months!

That had its own problems, of course. We were very lucky because I think we made a lot of right decisions. We made some wrong ones, but there comes a point in a film where you better have made the right ones because you can't go back.

V: *Do you think anyone will be brave enough to try something else like 'TRON'? What about a 'TRON 2' since some of the information has been stored on a computer disc?*
HE: I hope somebody will do something like *TRON*. If somebody has a good enough story, a unique enough thing, it will get done.

As regards *TRON 2*, yes, we've already got the light cycle programme in there and other bits as well. If we were to do another, we'd have to invent new and more fantastic things and vehicles. But I think, for the same amount of money, we could do 20 or 25 minutes instead of 15 or 16. After all, we already spent $2 or $3 million on research and development, so it's an advantage. But I, personally, wouldn't be too enthused about doing a sequel. It's so much more fun doing something the first time! ■

© Randy and Jean-Marc Lofficier.

BACKLIGHTING TECHNIQUES

BY HARRISON ELLENSHAW

The whole thing is really pretty easy to do, but the problem in TRON came from the fact that we wanted to colour the guards one colour (red) and the Programmes another colour (blue or yellow). How do I do that?

Well, if you put the film down on a light board, and the light shines through everything, all you have to do is make a stencil that you place over the guards. When you do that, as the light shines through, it does not shine through the guards. You would put a colour filter in the camera for the colour you want. Everything that appears as light on the film will then shine through the colour that you want, in this instance, blue.

Now, by using a combination of elements, you find that if you make enough stencils, you can isolate any part of the frame. After all, you don't want colour to come through anybody's face, so you make a stencil for that, etc.

When you get ready to do the Guards, you make a stencil that just allows the guards to come through. Then, to let the circuitry come through, which is black on white, you make a negative. That allows the circuitry to shine through. You also have the problem that you don't want to let the background come through. So you make another stencil for *that.*

Now, you have to do this for *every* single frame in the film. It's pretty simple to do it for one frame, but for 75 000 frames, it becomes a little bit more complex – or rather, more time-consuming!

If all of the frames were to contain, say, only two different types of characters, you would have an additional 300 000 elements. Sometimes, we could get away with just two elements, and therefore two stencils per frame, but that was the minimum.

So the minimum number of elements for 75 000 frames is 300 000. We used approximately 450 000. The problem is: where do you put it all? How do you keep it in order? How do you photograph it? How do you get the inkers and the painters to paint the correct thing, make sure they block out the right stuff, put it in a box neat enough in the proper order, etc?

Then somebody picks it up, takes it to a scene coordinator, who then tests it all on a light box, and determines the exposure. He puts it back in the box, takes it down to the cameraman who looks at it and says, 'What the hell am I going to do with this mess!'

But he takes it and puts it all together, so that when you look at it in the dailies, it works fine.

That's the organization. This kind of assembly line has to be very precise because you don't have just one cameraman who looks at the first frame and then figures it out himself, and then can do it again. You've got 13 cameras, ten scene coordinators, 200 inkers and painters, etc! 80% of all of the inking and painting was done in Taiwan because it had to be done in three and a half months. We also had 20 or 30 inkers and painters here who would do what we called 'sample art'. They would take one frame from each stack, which consisted of a scene, and decide where everything went.

We'd actually do a sample so that somebody could take it and say, 'I see what they want to do!', then they could do the other 200 frames or whatever that scene consisted of.

There were problems at first with this approach. The paint came back too thick. All of the cels were stuck together because it hadn't dried well. The body matts weren't within the lines, etc. So we had to organize very strictly everything, so that it could go to any camera at any time and come out the right colour. In the process, the work could be picked up in progress by different cameramen and scene coordinators without any problems. ■

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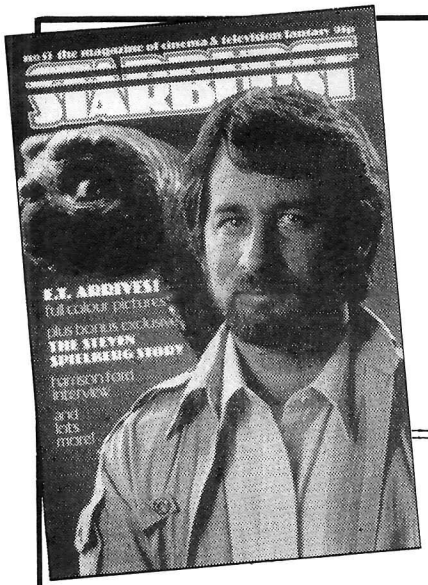

DANCE THE FILM FANTASTIC!

And what better tune to choreograph your fantasy reading habits to than Starburst, Britain's original fantasy film magazine. Within the covers of Starburst you will find reviews of all the latest fantasy releases, news on forthcoming projects and retrospects on the science fiction and horror classics of yesterday. All this plus interviews with the top stars from both sides of the camera.

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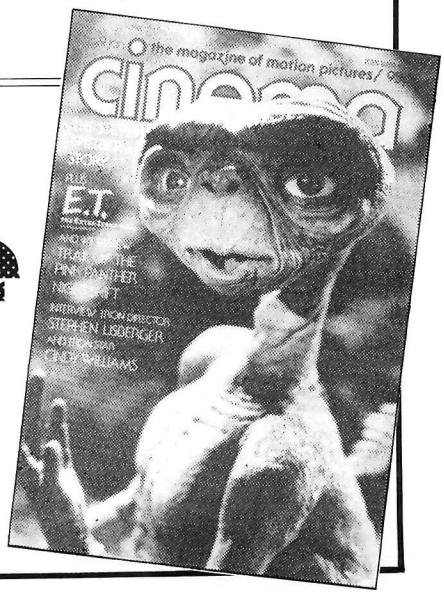

Unlike other film magzines available in your local newsagents, cinema does not restrict itself to one narrow apect of the movie business. Among its colour-packed pages you will find features on the art movies as well as the exploitation films, interviews with producers as well as directors and stars, previews of coming attractions and retropectives on movie classics.

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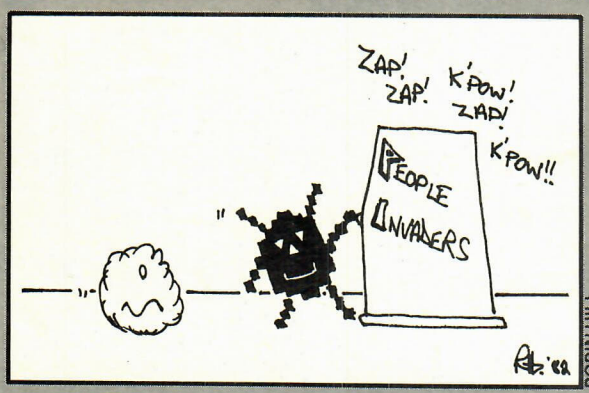
ROBINSON

COSMIC CUTS

A little light year relief for readers of New VOYAGER



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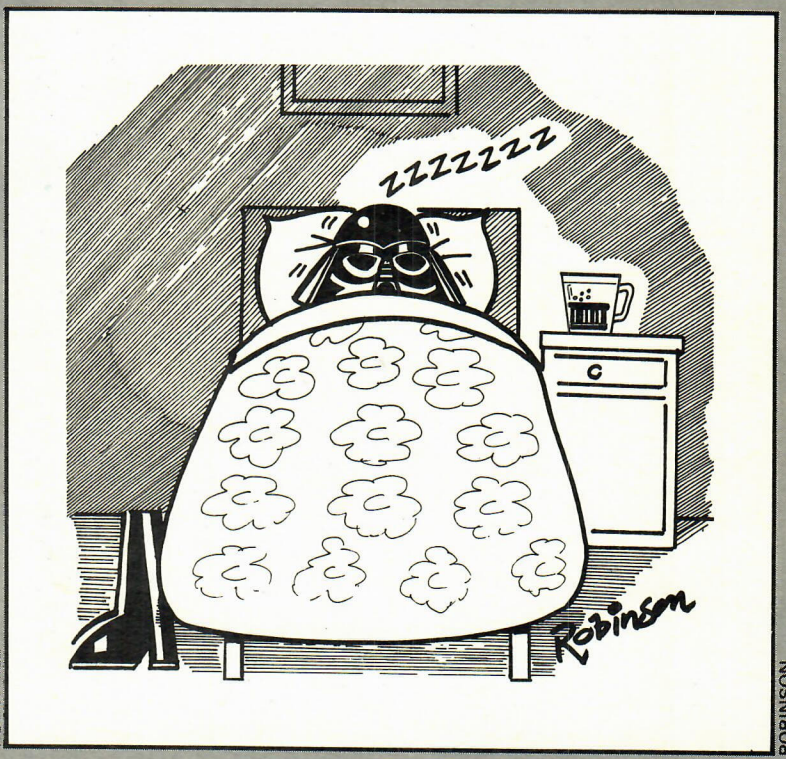

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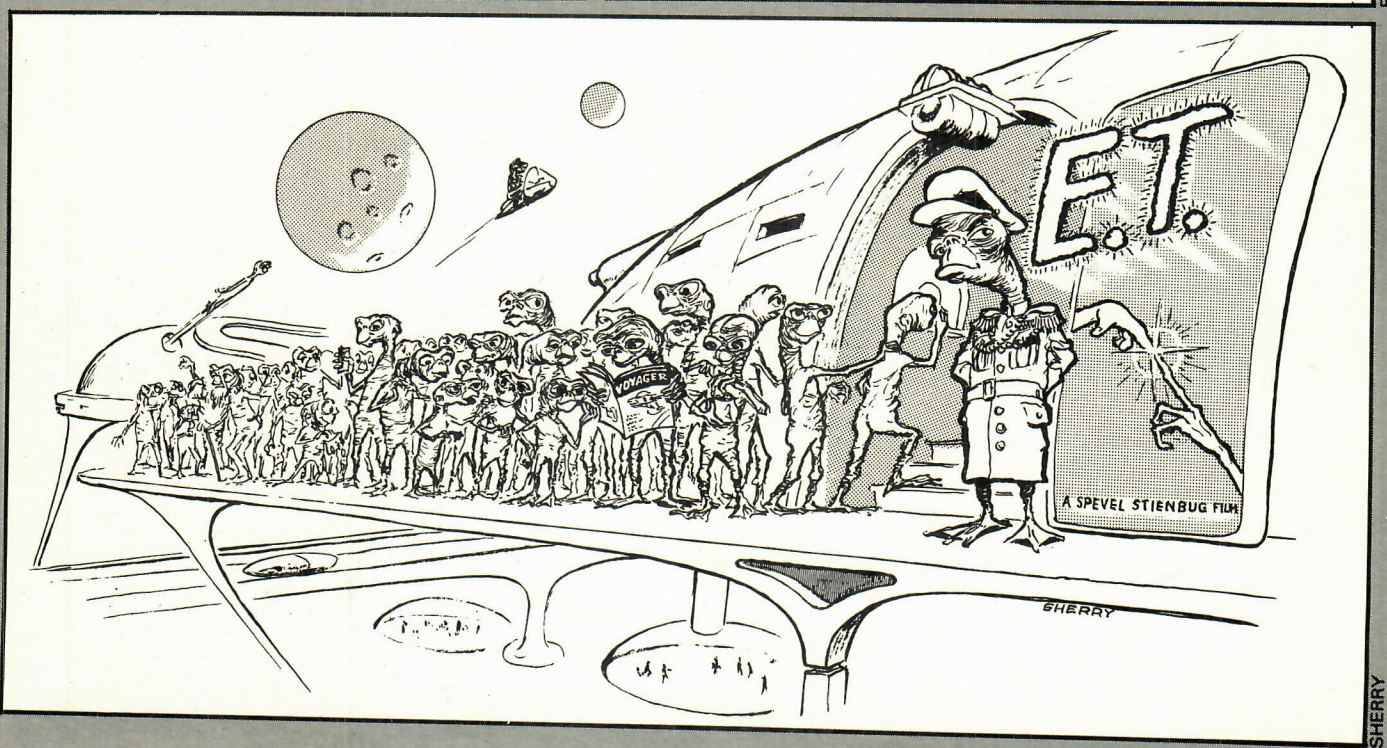


SHERRY

PRODUCTS

There's also a 'pop-up' UFO. Wind up the E.T. spaceship and, as it spins like a top, a hatch opens and a tiny E.T. pops up. Also from LJN is a play unit designed to hold a clip-on spaceship; press a button and a miniature E.T. figure will shoot out. Best of all, though, must be the 7 ins. talking E.T. with a pullstring in his back to operate the voicebox. His vocabulary includes: 'Ouch', 'Elliott', 'E.T.' and 'Home'. UK distribution will be handled by **Matchbox.**

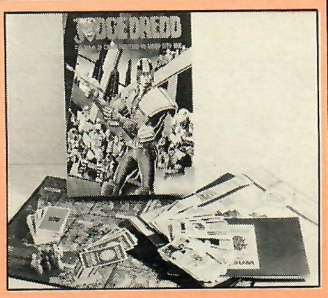
All of the above is but the tip of a large iceberg and we'll be bringing you further details of *E.T.* merchandising material in our next issue. By then, hopefully, more UK outlets will have been firmly established. **RLR**

E.T. merchandising hots up

When *E.T.* swept the US by storm last June the inevitable, albeit carefully-planned, flood of associated tie-in products followed. One of the most popular items has been the 9 ins. high stuffed toy manufactured by **Kamar International** of 23639 Hawthorne Blvd, Torrance, California 90505 (see photo) who, at one stage, were filling orders of $2 000 000 per day to the tune of $15 per doll. A spokesman for the company, Russ Fons, has stated that their two synthetic E.T.s, stuffed with crushed walnut shells, were being manufactured in 20 factories in Korea and Taiwan. One American department store chain was so keen to receive their consignment ahead of rival shops, that it chartered two 747 Jumbo jets to fly them in and so beat Kamar's own delivery date!

Another manufacturer of E.T. models is **LJN Toys** of New York, their current range includes: six different 2 ins. vinyl E.T. figures. One holding a telephone, one with an alphabet book, one wearing a blond wig and costume, one wrapped in a blanket with a tiny 'Speak and Spell', a bleary-eyed E.T. in a bathrobe holding a can, and another figure gripping a flower pot.

It's going to be an E.T. New Year! The Kamar E.T. soft toy (top left), which has done such tremendous trade throughout the USA in recent months, is one of the most popular items – Knickerbocker Toys of Wokingham distribute in the UK. Left, Matchbox 'Action Figure' with moveable arms and extending neck. This, and the 'Collectible Range' (from which two are shown below), is part of a large number of E.T. toys from Matchbox. We'll be bringing more details of these, and other E.T. merchandise, in our next issue.
Photos: RL Rimell and Extel PR, Ltd.



Judge Dredd Rules!

Readers of *2000 AD* will need no introduction to the exploits of *Judge Dredd* and his tireless fight against crime in Mega-City One. Fans who want to get even more involved with their comic-strip hero can now do so with the Games Workshop Judge Dredd game for two to six players. Designed by Ian Livingstone, who charts the Judge Dredd phenomenon elsewhere, this fast-moving, action-packed game provides two playing boards, 54 action cards, 21 sector cards, 28 Perp cards, 28 crime cards, 6 Judge cards, 1 turn start card, 6 playing pieces, 1 die and 1 'Umpty Candy Card Album'. The latter has no direct involvement with the game but adds to the fun by providing additional data on sectors, crimes and perps. The card album reveals the inside story on Otto Sump's Ugly Clinic and Sunshine Synthifoods and warns you of the dangers you run by littering, umpty bagging, boinging and stookie glanding. Watch out, too, for your arch enemies, the criminal element of the city: Gestapo Bob Harris, Lumpy Lepke, Professor Milton D Frankenstein and Denis, the Angel Gang, the fearsome Judge Death and many more.

Very simply, the object of the game is to enforce the law and dispense justice. Each player adopts the role of a judge patrolling the crime-ridden streets of Mega-City One. As reports of misdeeds are announced, each Judge runs to the scene in an effort to apprehend the criminal. The winner is the player who has arrested the greatest value of both crimes and criminals by game's end. Everything is clearly spelled out in the instruction leaflet and once you've started, there are plenty of surprises and fun in store. Can you bring to justice the evil Orlok the Assassin or Joseph 'Mad Tooth' McKill? Join Judge Dredd and find out if you're man, or woman, enough for the job! **RLR**

CONVENTIONS

FEBRUARY 4-6, RA CON, Edinburgh. G O H Harry Harrison. Chris Anderson, RA CON, 77 Baron's Court Terrace, Edinburgh, EH8 7EN.
FEBRUARY 5, COMICMART, Central Hall, Westminster. (Opposite Big Ben) Afternoon only. Free.
MARCH 4-6, EMPATHICON, Liverpool. G O H Thom (Hawk) Christopher. Dot Owens, 30, Ovenden Way, Halifax, N. Yorks., HX3 5PF.
MARCH 26, COMICMART – as February 5.
APRIL 1-4, ALBACON, Glasgow. Guests: James White, Tanith Lee. Albacon II c/o Doug McCallam, B/L 8 Highburgh Road, Glasgow.
MAY 27-30, SOL III, Birmingham. Guests: James Doohan, Walter Koenig, Anne McCaffrey, Bob Shaw. Sol III Convention, 39, Dersingham Avenue, Manor Park, London, E12.
JUNE 4, COMICMART – as February 5.
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CONVENTIONS

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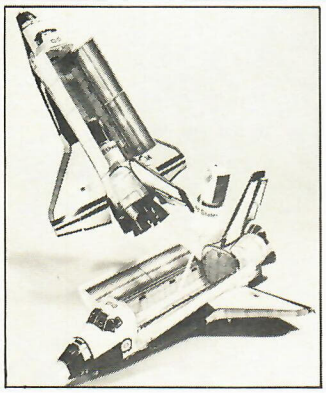


The Pelham Books Space Shuttle is a truly novel item; a kit of the book, or the book of a kit? With care, a most realistic model will result and amply repay patience and effort. Also available is a freelance design Space Freighter which builds into a model some three feet in length.

Cardboard Shuttle from Pelham

You might wonder what a couple of books are doing in this issue's **Products** column, but **Pelham**'s *Space Shuttle* and *Space Freighter* are true cut-out cardboard models contained between two sets of covers. As can be seen from the photograph, the results are most realistic and you don't even have to worry about painting because all the sheets come pre-coloured. As with most card models, the individual items must be cut out from the sheet with a sharp knife and using a metal ruler as a straight edge. There are lots of other things you should know, but all is explained in the 24 page instruction book bound into the centre of the printed sheets.

Created and designed by Wayne McLoughlin, both build into impressive models and large ones at that; the Shuttle is 24 ins. long while the Space Freighter exceeds three feet! Construction time is around 50-60 hours but we urge modellers not to rush things for fear of spoiling these fine models. Published by Pelham Books of 44 Bedford Square, London, the 'kits' retail for £4.95 each and make an ideal introduction to space modelling. But don't just take our word for it, go out and try one for yourself! **RLR**

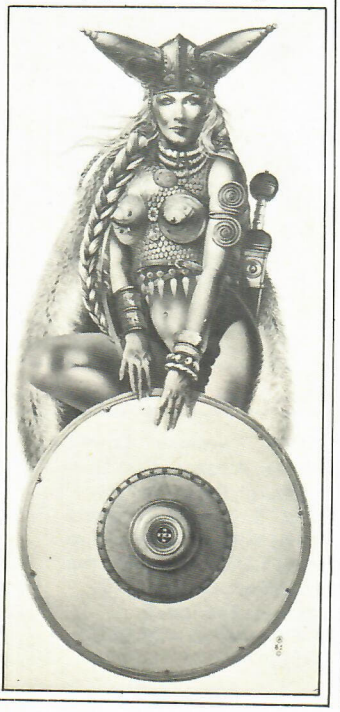
Iguana calendar

Chris Achilleos is one of the world's leading fantasy artists whose coldly erotic amazons doing battle with unspeakable monsters have acquired him a deservedly high reputation. For all fans of fantasy art, the Chris Achilleos Amazons Calendar for 1983 is a must. It is a beautifully presented collection of full colour illustrations showing his most formidable warrior women all in one package. Reproduction is of superb quality throughout this giant calendar, each picture measuring 11ins. x 15ins.

Chris Achilleos can boast 500 book covers, many film posters and magazine commissions to his credit and his art has been exhibited at galleries in London, Paris and the USA. Book credits include: *Dr. Who; Conan;* titles by Edgar Rice Burroughs; Michael Moorcock and Anne McCaffrey. Poster commissions include the films *Clash of the Titans, Blade Runner,* and a sequence for the adult animated film *Heavy Metal.*

A highly successful collection of his work has appeared in the form of a book, *Beauty and the Beast,* which has sold 90 000 copies. A second, and more comprehensive, volume will be published by Iguana in the Spring, entitled *Works of Fantasy.* Meantime, the Iguana Chris Achilleos Calendar is available now at £8.30, a price which includes post and packing. **RLR**

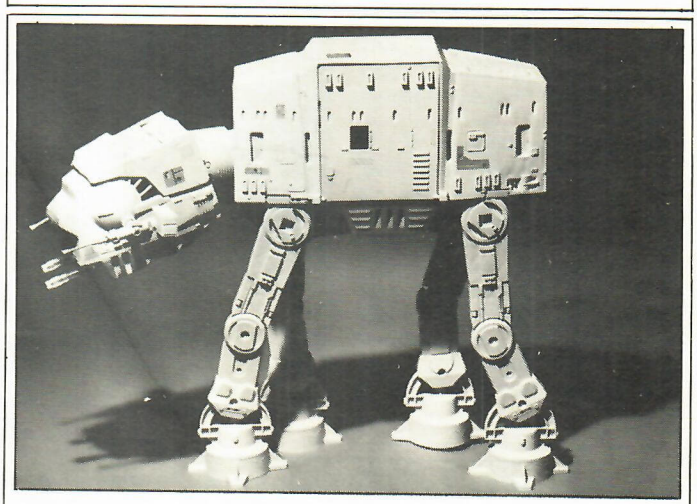
An example of Chris Achilleos' © amazing amazons. Photo: Courtesy Iguana Publishing, Ltd.



Role Playing miniatures

Ardent fans of *RuneQuest, Chaosium, Ltds* popular fantasy game, will welcome **Citadel Miniature**'s boxed figure sets. Made in the UK by **Games Workshop,** Set 2 Adventurers, includes ten 25mm white metal figures which can be used to portray both cultists and player characteristics. These highly-detailed castings include the following Adventurers: Llankhor Mhy, Orlanth, Kyger Litor, Zorak Zoran, Aldrya, Baboon, Duck, Morokonth, Dwarf and Non-Cultist. Attractively boxed at £3.95 the figures are all ready for painting and the foam-lined box insert provides easy storage for the models when transporting them.

The *RuneQuest* figures are but one example of a large range of boxed sets produced by Games Workshop especially designed for use with role-playing games. Two of their most popular releases are the Speciality Sets, aimed at those embarking on their first game venture. The *Dungeon Monsters Starter Set* includes: large orc with axe, skeleton with scimitar, skeleton with sword, zombie, spectre, goblin with mace, goblin with axe, minotaur, harpie and giant spider – more than enough to set your teeth on edge! To combat these are ten figures in the *Dungeon Adventurers Starter Set.* Included are: wizard, palladin, fighting man, female fighter, dwarf fighter, dwarf thief, gnome, thief, sorceress, elf and expedition mule. As with the *RuneQuest* set, these two retail for £3.95 each. **RLR**



Big scale AT-AT

Not exactly new, but fairly topical, the big **Palitoy** *AT-AT* is one of the most impressive models in the *Star Wars* toy range. Priced at around £35, the Walker is moulded in tough polythene, has moveable legs, head and neck and can be crewed with Palitoy Action Figures. Laser cannons are powered by batteries and 'pulsate' with light in realistic fashion.

The *AT-AT's* size makes it almost compatible with the Airfix *Snowspeeder* kit (see pages 60-65), and an ideal candidate for extra detailing and a weathered finish to support our diorama. **RLR**

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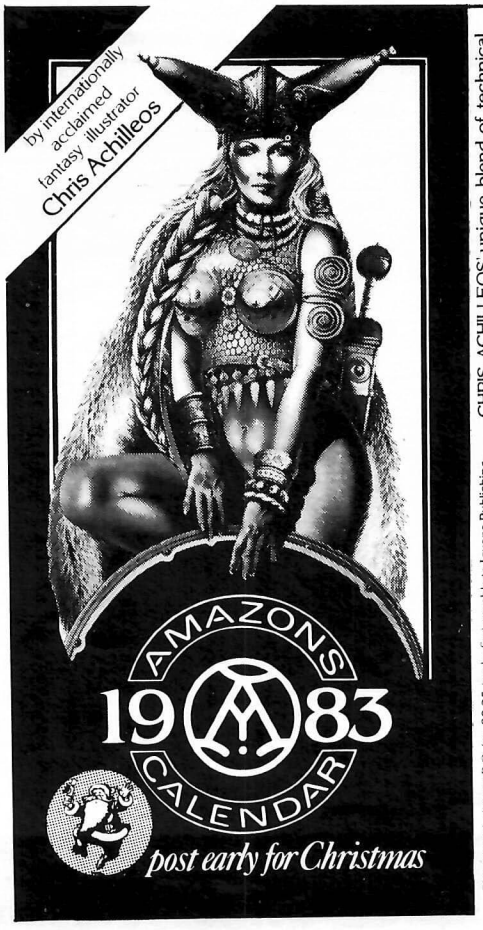

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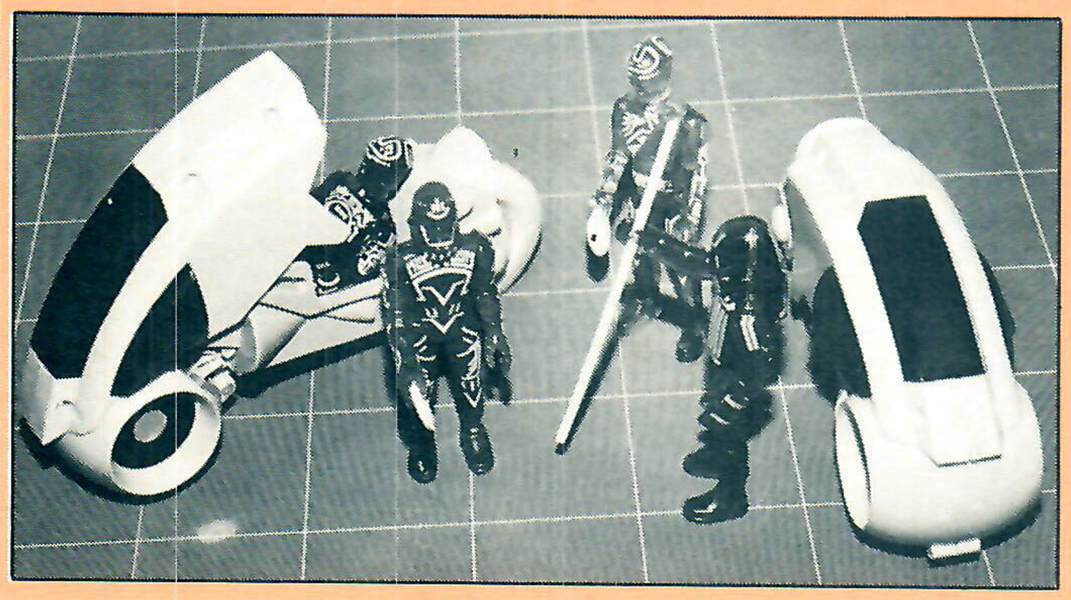


Tomy Light Cycles

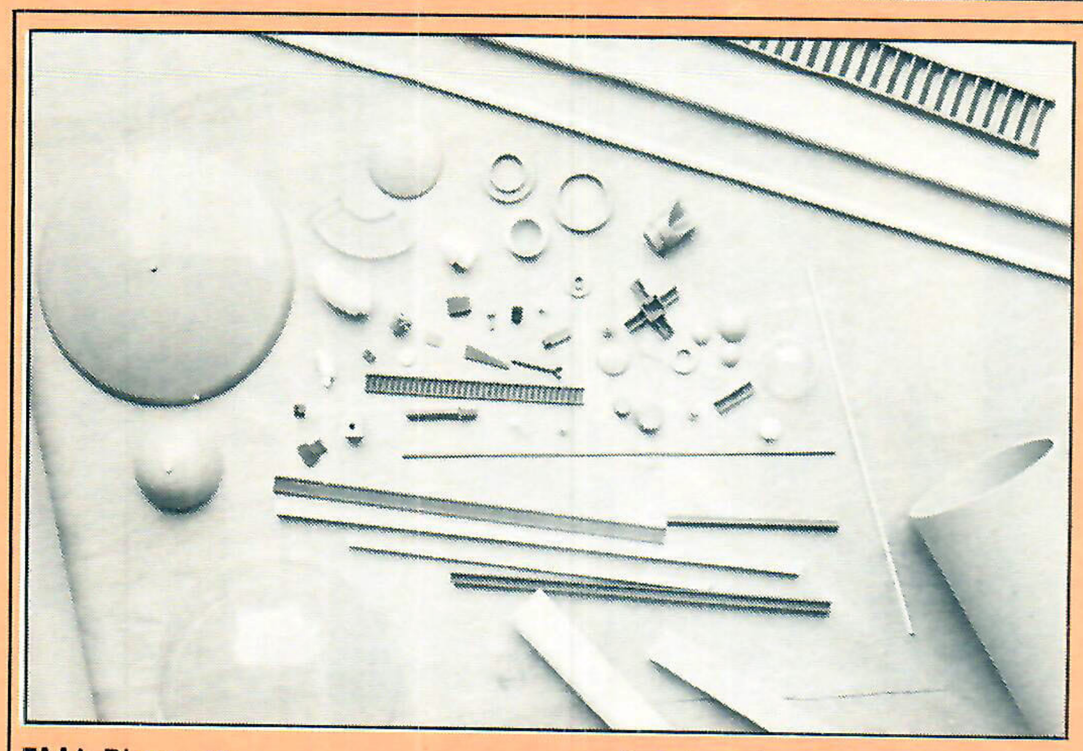
Following the release of *TRON* in the USA last June, the Japanese manufacturer **Tomy** produced an exciting model of the *Light Cycle* together with a range of scaled action figures: *Sark, Flynn, Tron* and a *Light Warrior,* moulded in soft, translucent plastic. The Light Cycle features a gyroscopic rear wheel fitted with a small cog; simply insert the plastic toothed rip cord provided, pull hard, place the cycle on a smooth surface and watch it accelerate and tear away. The cycles attain quite a rate of speed, are self-balancing and, thus far anyway, have proved virtually indestructible. It's all tremendous fun and they'll be great to race across the school assembly hall or playground. The cycles, which retail for £3.99 each, are moulded in tough plastic, with sprung front wheel and opening canopy to accept the specially-produced figures.

Each of the four *TRON* 'action men' have moveable heads, arms and legs and carry luminous light 'frisbees', except for the Warrior which bears a lance – also luminous. Retailing at £1.49 each, the figures would appear to be as hard-wearing as the cycle but due to their soft texture, jelly-like appearance, and bright colours, don't leave them around for toddlers to find. They *could* be mistaken for sweets!

Tomy's range of *TRON* products is now available from all good toy shops but, in case of difficulty, contact the UK distributors, **AA Hales, Ltd.,** of PO Box 33, Harrowbrook Road, Hinckley, Leicestershire. **RLR**

Milton Bradley make Traks!

From **Milton Bradley,** is a six wheeled tank-type vehicle of a design similar to a cross between something out of *Star Wars* and NASA in its more wilder moments! Moulded in polystyrene, the basic colour is white, with grey accessories, and on the back is the simple keyboard which will programme it to perform certain manoeuvres. In fact, this programming is very similar to that of a computer, so if you want to move it forward, you have to say by how many units; if you want it to pause, again by how many units, it will stay still; if you want it to turn, key in what direction and by how many degrees. Relatively complex programmes (up to 16) can be built up and gimmicks are restricted to a 'photon beam' at the front of the vehicle, which can be programmed along with the basic movements. As a separate accessory there is the *Big Trak* Transport, a trailer that connects (via a jack plug) into the top of the vehicle. One of the programming steps will then order the trailer to tip. **MI**



EMA Plastruct

It's probably true to say that there can't be many science fiction films or television programmes in recent years that haven't employed the services of **EMA Products** in their miniatures and special props.

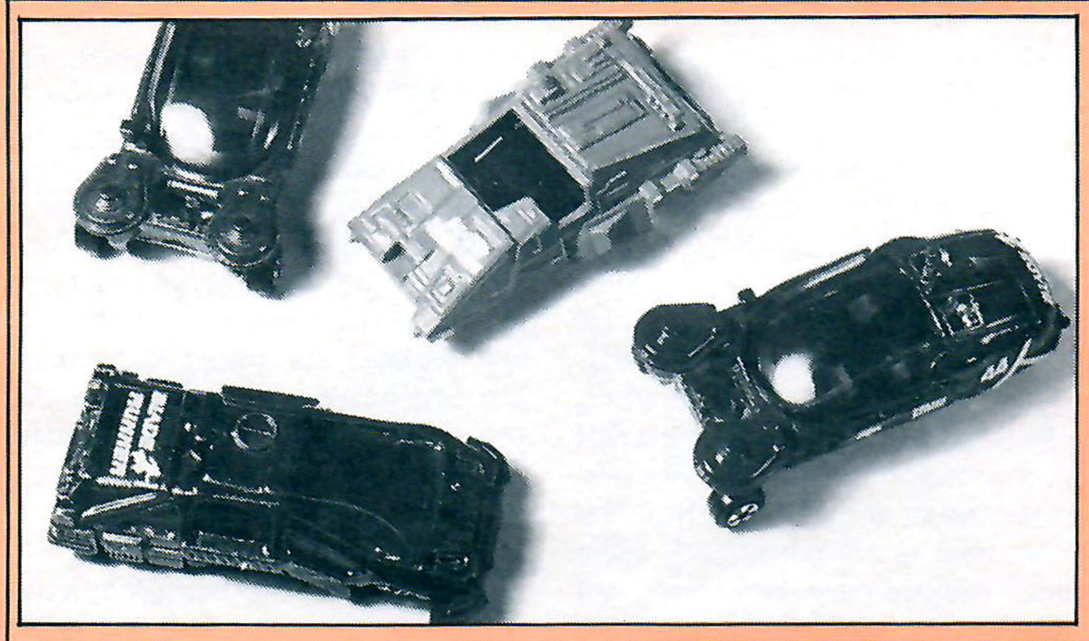
Not so many years ago, EMA (or Engineering Model Associates to give it its full title) was concerned with supplying plastic parts to professional modelmakers involved in building construction prototypes of chemical plants. However, it wasn't too long after the European branch of the American company was set up in West London, that the special effects boys (including me) found them and started adapting all those lovely mouldings into things EMA had never dreamed of. EMA rapidly caught on and the window of their premises in Feltham changed, virtually overnight, from displays of miniature powerplants to a variety of models, including spaceships, but also traction engines, tanks and other less obvious objects constructed from EMA parts.

For anyone unaware of just what EMA produces, basically they manufacture a system of plastic parts that fall roughly into several types. All are based around the 'chemical-plant' type of requirement, but it doesn't require much imagination to adapt hemispherical heads, intended as the tops of boilers, into the front ends of spaceships. One series deals with pipes ranging from 1/32nd ins in diameter up to two ins, the majority available in a wide range of colours.

The very smallest item is plastic-coated wire, but by the time one gets to 3/32nd ins, it's true plastic tube, made in the ABS of which all the range (with very few exceptions) is from. ABS is a tough plastic, which doesn't actually dissolve with ordinary polystyrene cement, but will easily glue with the liquid cement that EMA produces. The pipe range includes 'T's, elbows and bends, as well as flanges and pipe supports, and augmented by the 'Vessel System' which contains pipes up to 12 ins in diameter. Colour is limited to grey for these parts but they will take model paints perfectly.

Three types of 'heads' are available for the 'vessels', including not only hemispherical 'heads', but also elliptical and dished; the latter very useful as antenna dishes! 60° and 90° cones are made, the former of which is almost the correct angle for an Apollo Command Module.

Another series is devoted to the 'structural system' and here are all those girders you could only otherwise get from **Airfix** Girder Bridges or certain **Faller** kits: 'I' beams, 'H' beams, 'T's, 'L's and channels all in a variety of scales. Also square and rectangular section lengths, intended as 'fireproof columns



Diecast Spinners

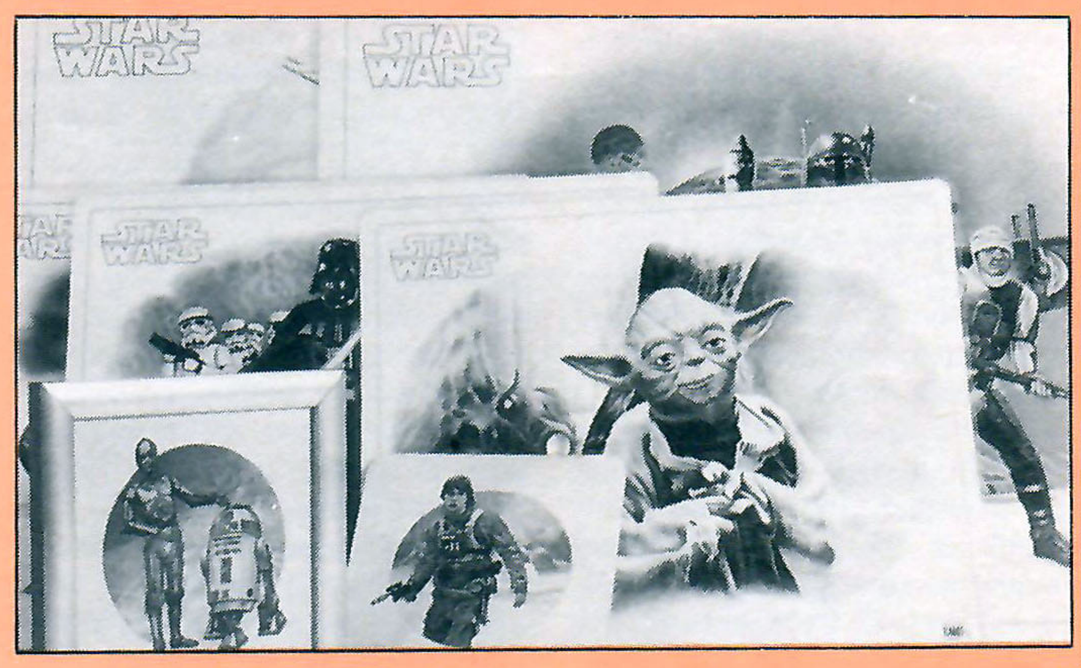
Blade Runner fans take note; 1/64th scale diecasts of Spinners are now available from **Ertl.** You can either obtain them collectively, *ie,* Deckard's Chase Spinner and Ground car, Rachael's Spinner and Bryant's Police Spinner, all in one display 'box' for £3.50 or as individual models shrinkwrapped on card headers for only 79p each. Although small, with an average length of just three inches, the diecast models are well detailed with full interiors under clear canopies in each case. The futuristic Spinners made for *Blade Runner* were among the SFX highlights of Ridley Scott's critically-acclaimed film and the Ertl versions closely mirror the originals which, being reasonably priced, should make them real collectors' items.

Ertl's *Blade Runner* models can be obtained from all good model/toy shops but, in case of difficulty, get in touch with Ertl UK, at Unit 5, Alphinbrook Road, Marsh Barton, Exeter, EX2 8RG, who kindly supplied our review samples via the parent company in Iowa, USA. **RLR**

Star Wars table mats and prints

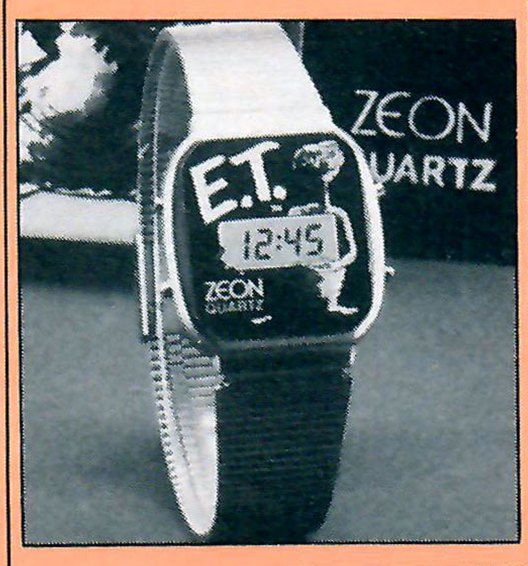
From the **Icarus Company** comes a range of *Star Wars* merchandise that should appeal to all fans of the saga. First, a series of large placemats, $12\frac{1}{4}$ ins. x $16\frac{1}{4}$ ins., depicting scenes from both films and retailing for a modest 99p each. A range of smaller mats ($8\frac{5}{8}$ ins. x $10\frac{5}{8}$ ins.) is also available. These cost 70p each and, like their counterparts, are heat resistant to 300°F (148°C) and easy to clean. Icarus also produce small placemats at 70p, framed prints (5 ins x 5 ins.) at £1.75 and unframed versions for 50p. The illustrations are not film stills, but carefully executed paintings and should really brighten up the dinner table! Another item that Icarus produce is memo boards with Darth Vader and Storm Trooper or Luke, Han and Princess Leia images complete with a felt-tip pen for those all-important messages. Priced at £1.50, the boards, and all the above items, are produced by the company at 6-8 Banks Road, Poole, Dorset. **RLR**

PRODUCTS REVIEWERS:
TB: Tony Bath. **MI:** Mat Irvine. **RLR:** Ray Rimell.



Time for Star Wars!

The **Bradley** *Star Wars* watch has been a consistent top seller for many months and it's not difficult to see why. Manufactured by **Zeon, Ltd.,** of Station Road, Industrial Estate, Hailsham, East Sussex, it comes complete with a musical alarm which plays the *Star Wars* theme tune – and very well at that. Not obvious in our photo is the image on the dial proper; alongside the digital read-out is a planetoid surface over which a *TIE Fighter* 'flies' by way of six images continually increasing and decreasing in size. All rather clever especially since the spaceships occur every second and other features include date, month and year reminders and, yes, it *does* tell the time as well! The official *Star Wars* wrist watch retails for around £7.99 and has now been joined by an *E.T.* watch. **RLR**

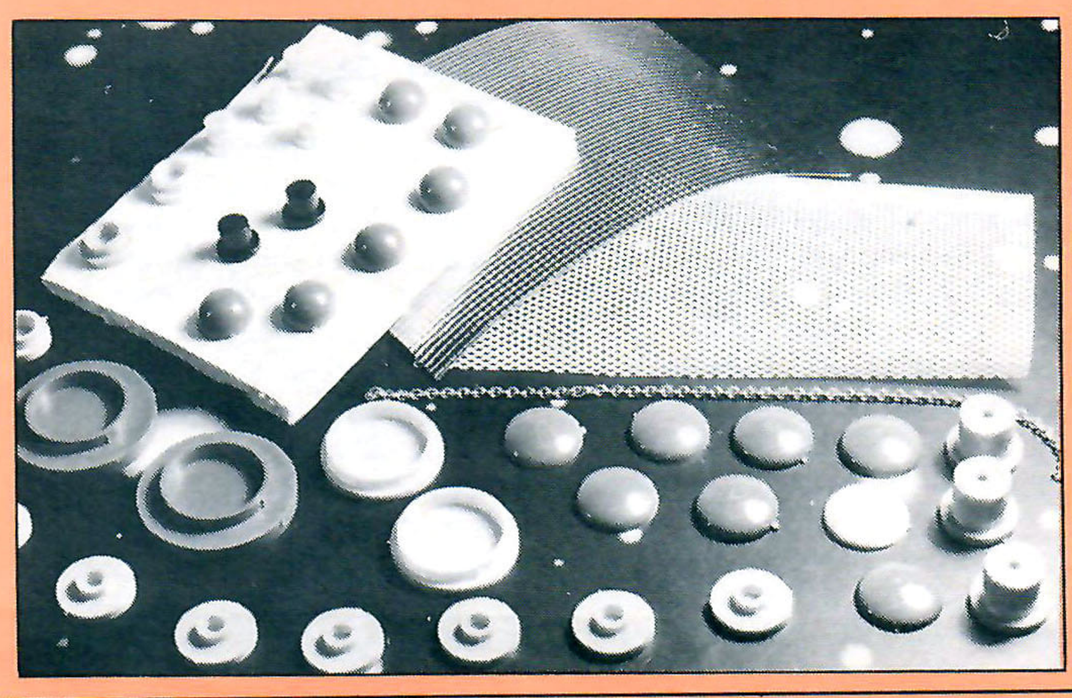


and beams', but very useful when it comes to building basic structures.

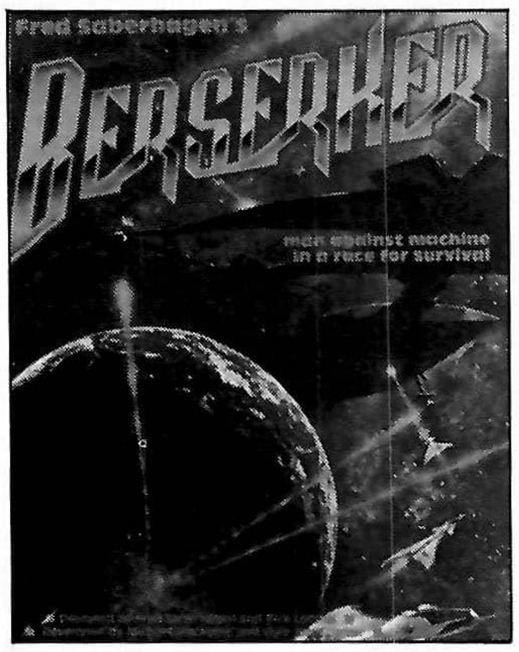
Many other parts fill the catalogue, some seem to be very specific but which very soon find their own niche, because they can be bought in any number. (In fact every part down to the humblest $\frac{3}{8}$ ins. marker disc can be bought separately.) Shapes can be built up using the same part and, what must be my particular favourite item (because it is so adaptable) has found its way into most scratchbuilt models. All it is, a tiny wedge, designed to hold girder sections in place and identified by the catalogue reference KW.

Besides the professional market, EMA soon realised the hobby potential of the product and introduced **Plastruct.** This is really just the smaller end of the EMA range, and the sort of item the average model shop will stock. Readers of this journal will be pleased to hear that EMA have now introduced a special starter pack of pieces for model spaceship builders (below), exclusively for *VOYAGER.* Further details of this useful accessory package can be found in EMA's advertisement elsewhere in this issue.

The Feltham-based company also produces a fine range of spray paints which I frequently applaud. They are designed to complement the plastic colours and have a useful semi-gloss finish. Amongst the more usual colours are four very useful shades of grey and the invaluable 'LP' primer. The only snag here is that they cannot be sent by post, so unless your local shop stocks it, you'll have to take a trip to Feltham. If your local stockist doesn't carry Plastruct, you can get the catalogue direct from EMA Model Supplies, Ltd., at 58-60, The Centre, Feltham, Middx., TW13 4BH, enclosing 70p (which includes p & p.) **MI**



PRODUCTS



Berserker from Flying Buffalo

Space games seem to vary between the very complicated and the relatively simple. *Berserker* does not fall into either extreme, although its rules are not particularly complex.

Based on the science fiction novels of Fred Saberhagen, it is a contest between the Berserker – an automated spacecraft set to destroy Earth – and the planetary defences, comprising manned spaceships of several types and fixed planetside artillery. The Berserker is very powerful, and it is also hard to destroy since it is equipped with self-repair facilities. But it is not *all*-powerful, and its operator has a lot of tricky decisions to make. He has a crew of 18 robots, and has to assign them to various tasks: repair, manning the Berserker's guns, crewing the cruisers it can spawn off, repelling the Earth Marines who will try and board. A wrong decision can be fatal.

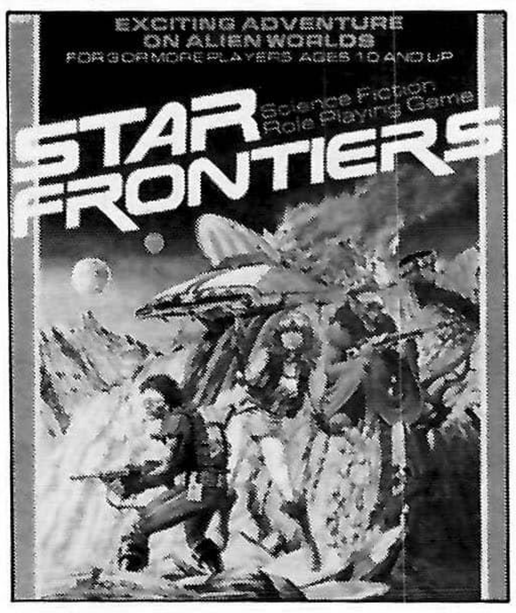
The Earth player, likewise, has various tactical decisions to make – how to spend his initial points on C-plus guns, cruisers or ramships, for instance. Each has its particular part to play, but all need to be balanced into a co-ordinated attack.

Berserker comes in a solid box with a graphic cover. Contents consist of the rule book (eight pages), hexed starmaps, tracking sheet, and two sheets of coloured counters. All are well produced, though I find it hard to understand why the Berserker counters are not of the punch-out variety, like the other sheet, and need cutting. The mapsheet is not particularly large since the ordinary game does not require very much space; rules are given for much larger games involving more than one Berserker and planet, but these would probably need an extended mapsheet.

The rules themselves are easy to grasp and follow; as with all the best games, it is how you perform tactically which counts, rather than how you interpret complicated rules. Basically, the Berserker attempts, by its various weaponry, to destroy the planetary defences and then Earth itself; the defender uses all his resources to inflict damage on the Berserker. Once damage is inflicted, the Berserker will have to use part of its robot crew to repair this, which will weaken its attack facilities. Usually, however, the final punch must be delivered by Earth Marines who board the Berserker via ram ships.

Optional rules allow for introduction of special features. For instance, Marines who have already survived a Berserker attack become veterans, with extra fighting powers.

This is a very well constructed and enjoyable game which should give many hours of entertainment. Obtainable from **Flying Buffalo,** PO Box 100, Bath Street, Walsall (or most games shops) at £7.95. **TB**



Star Frontiers

Star Frontiers comes in a sturdy box with a fairly lurid cover depicting some of the characters involved in the game. Inside we find a set of Basic Rules running to 16 pages, 59 pages of Expanded Rules, a sheet of playing counters, a map sheet printed on both sides, a pair of dice, a marking pencil, and a separate Adventure Module entitled 'Crash on Volturnus.' This original set is obviously intended to lead on to a number of separate adventure modules.

Setting up the basic game is fairly simple. The rule booklet tells you that one side will represent agents of the United Planetary Federation (the good guys) while the others will be agents of the villainous Sathar (the bad guys). Creating characters is done in the time-honoured way by rolling dice and consulting charts, but under the basic rules only basic characteristics are allowed for. Having established the characters, you proceed to equip them with weapons and other items. You are then ready to play the Basic Scenario, which is set in the City Block printed on the mapsheet.

Since all the various alternatives are already laid out in the booklet, all the referee has to do is to follow it through, rolling dice when action takes place, and giving the players the choice of several actions each move; whichever choice they make will determine which numbered paragraph the referee turns to.

Having played this through, both players and referee have now achieved a basic grounding in the rules, as well as enjoying the game! A second adventure is provided, in which the players are faced with an alien creature on the loose. This is played out on the same City mapsheet. Finally the Basic Rules end with a section on Designing Your Own Creature and Creating Your Own Adventures.

From this stage you move on to the Expanded Game Rules, which are considerably more complicated! Again, there is a resemblance to Dungeons and Dragons in the ways used to expand your characters and their various skills and abilities. The combat section is also much more complicated, while the equipment and weaponry is greatly extended. The booklet ends with a sample adventure game already laid out for the referee.

The Adventure Module is, in effect, a series of games based on the assumption that a spaceship has crashed on the planet Volturnus and that its survivors are faced with a hostile environment. The 30 page booklet is crammed with information for the referee and will enable him to keep the players going for a large number of adventures.

Star Frontiers is obtainable from **TSR Hobbies (UK), Ltd.,** The Mill, Rathmore Road, Cambridge, CB1 4AD. **TB**

Endless Plans, Endless Games

Role-playing games, such as Dungeons and Dragons, have for some time been generating what are euphemistically termed 'Players' Aids'; these are supposed to make things easier for both players and gamesmasters. Usually they do but they also tend to make role-playing more expensive!

When D & D first began, the Gamesmaster fabricated his dungeon himself, laying out each level with loving care and, I think, often getting as much enjoyment out of designing as in actually playing – just as I personally enjoy organising a campaign just as much as running it. Now, of course, a Gamesmaster can purchase commercial Dungeon plans which save him all that 'tedious' work – but is he as good and dedicated a Gamesmaster?

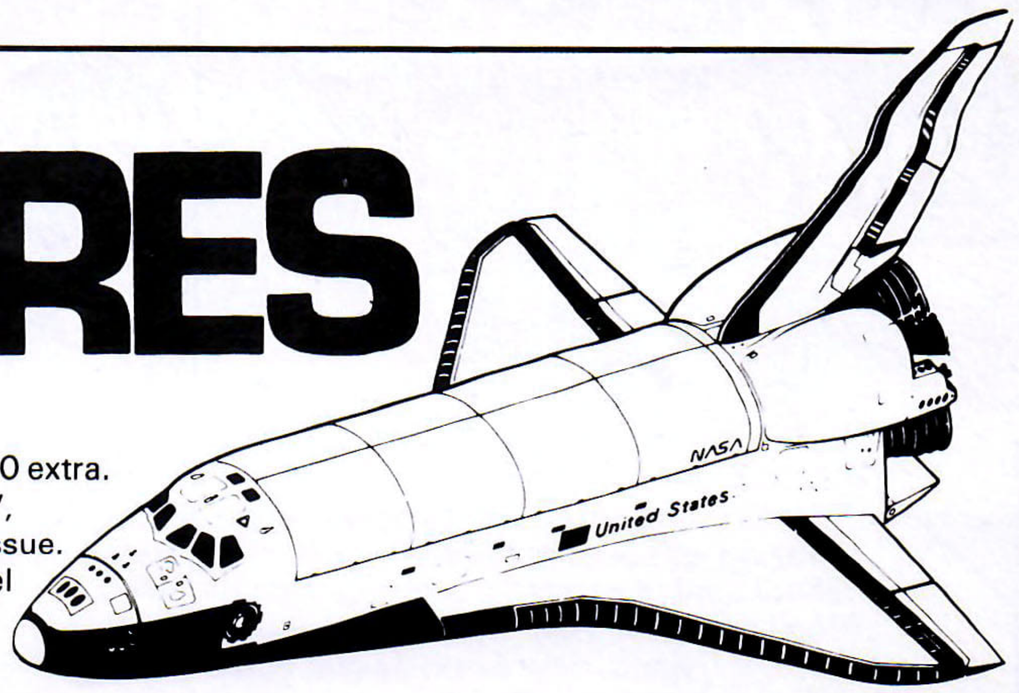
The fact remains, however, that Players' Aids are obviously here to stay and are very useful to a Gamesmaster who does not wish to spend too much time on setting up, and to the players in various ways. In the old days, one player in the group was always deputed to draw a map of the party's progress as it felt its way through the murky depths; with the advent of using 25 mm figures on the table, this was no longer so satisfactory. **Endless Games** have therefore come up with a solution in two sets of cut-out plans, which give a vast variety of shapes and sizes for corridors, rooms, doorways, etc.

Each set of plans has with it an explanatory booklet which tells how to use them to the best advantage. The main drawback seems to be that, once you have cut out all your various sections, you need some method of keeping them whereby you can easily and quickly find the piece you need to set up the Dungeon section you are dealing with. Small pieces of paper are easily lost.

The plans are printed on good quality heavy paper (or thin card whichever you prefer to call it) and should be reasonably durable. Their advantages are obvious – any size or shape of room or corridor can be quickly assembled on the table, your figures placed in position, the action fought out, and the pieces removed ready for future use.

Gamesters will, I imagine, find these plans an asset under most conditions. Both *Set 1 (basic)* and *Set 2 (Elaborate)* are obtainable from Endless Games at 2, The Old Bakery, Long Itchington, Rugby CV23 8PW for £3.99 per set. **TB**

STAR WARES



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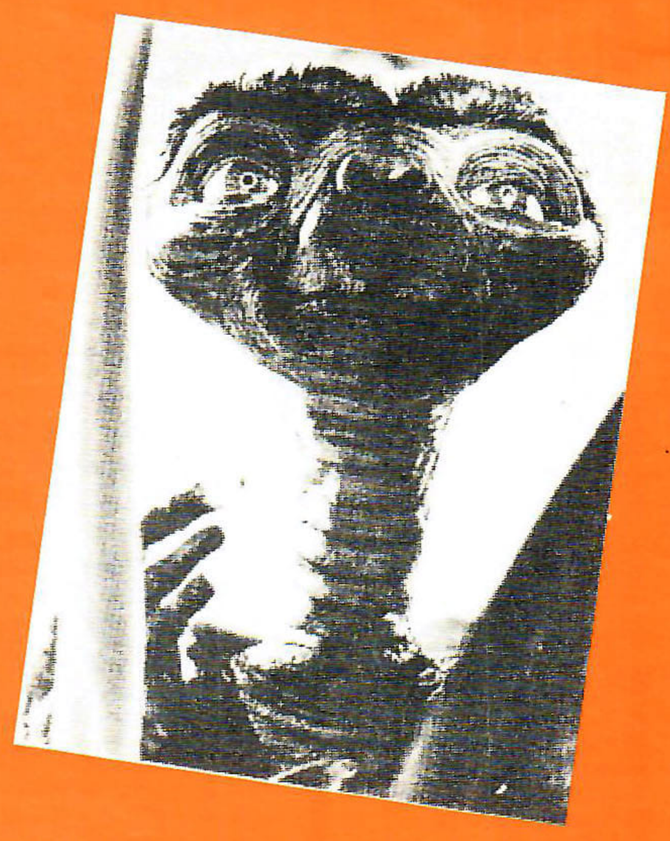

★ FEATURING . . .

- ★ More about Spielberg's latest money-spinner with news of E.T. merchandise.
- ★ An interview with SFX wizard JOHN DYKSTRA (below) who talks about his work on *Firefox* and the new *Starflight One* – with exclusive colour photos.
- ★ The Red Planet – MARS. Patrick Moore OBE unravels some of its mysteries.
- ★ CONVENTIONS. How to run them; how to enjoy them.
- ★ HOME-BUILT SPACESHIPS. We look at some scratchbuilding techniques for model SF craft.
- ★ John Wade discusses ways of producing SPECIAL EFFECTS PHOTOGRAPHS.
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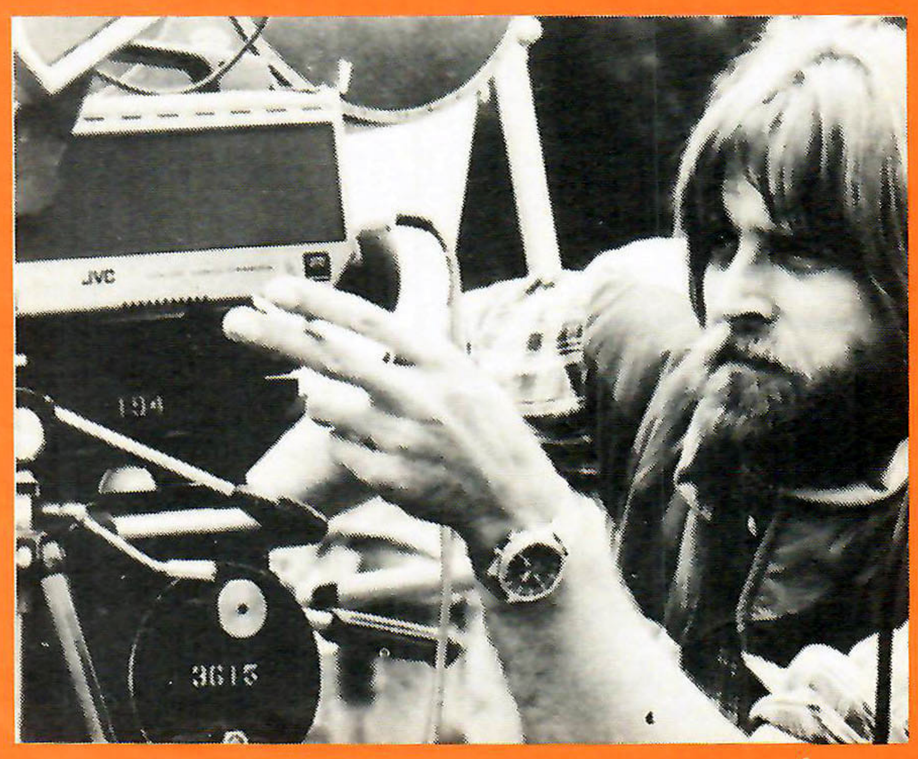

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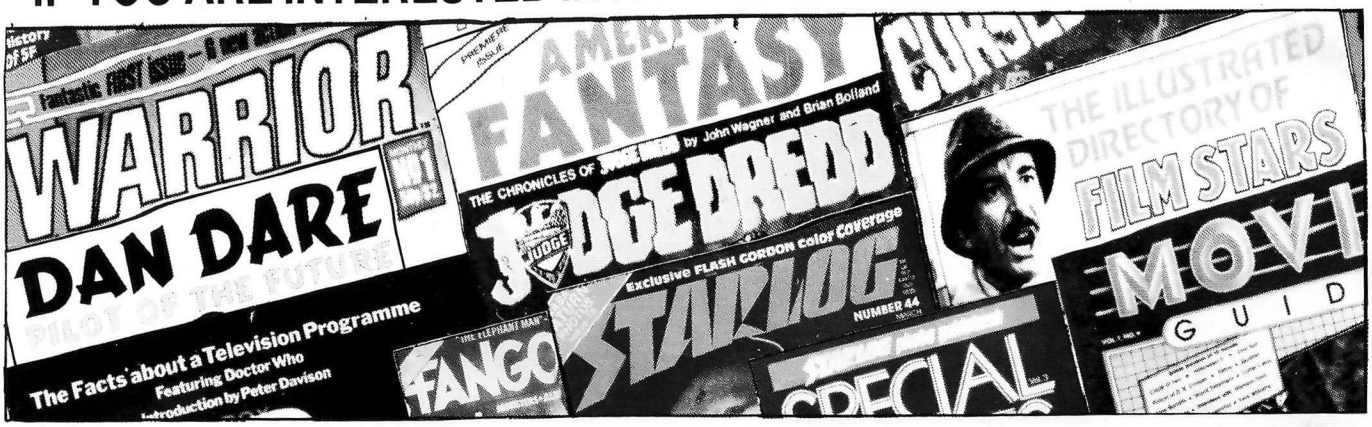

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